Metering Action Plan

Non-Urban Water Metering

July 2020

VICTORIA State Government

Melbourne Water is owned by the Victorian Government. We manage Melbourne's water supply catchments, remove and treat most of Melbourne's sewage, and manage rivers and creeks and major drainage systems throughout the Port Phillip and Westernport region.

Melbourne Water
Enhancing Life and Liveability

Use of Material

This Action Plan extensively uses wording and material from documents issued by the Department of Environment, Land, Water and Planning and the Murray-Darling Basin Authority. We acknowledge with gratitude the use of this wording and material.

Aboriginal acknowledgement

Melbourne Water proudly acknowledges Aboriginal people as Australia's first peoples and the local Traditional Owners as the original custodians of the land and water on which we rely and operate. We pay our respects to their Elders past, present and future.

We acknowledge the continued cultural, social and spiritual connections that Aboriginal people have with the lands and waters, and recognise and value that the Traditional Owner groups have cared for and protected them for thousands of generations.

In the spirit of reconciliation, we remain committed to working in partnership with local Traditional Owners to ensure their ongoing contribution to the future of the water management landscape while maintaining their cultural and spiritual connections.

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1 Glossary

AS4747-compliant meter – a water meter that has been either pattern approved or verified in compliance with the processes and procedures outlined in AS4747 – Meters for Non-Urban Water Supply, which sets the technical specifications for non-urban water meters as well as the installation, calibration and maintenance processes required to achieve pattern approval compliance (Standards Australia, 2013).

Bulk Entitlement (BE) - Water corporations and other specified bodies defined in the Water Act 1989 can hold bulk entitlements, either as a source bulk entitlement – an entitlement to harvest water directly from a water source - or a delivery bulk entitlement –an entitlement to be supplied water from another water corporation's dam or within a system regulated by the works of another corporation.

'Dozer' water licence – a water licence that is regularly inactive for significant periods of time. The term is often used interchangeably with 'sleeper' water licences (see definition in this glossary).

Emplacement - is the structure on or in which the meter is installed.

Interim standard –(also known as **Contemporary standard** as the standard was contemporary at the time the meter was installed) is a standard under which an installed water meter is likely to meet the ±5% accuracy range, and which has a manufacturer's certificate of accuracy of ±2.5% and has been installed to manufacturer's specifications.

Licence volume – is the maximum volume that the take and use licence holder is authorised to take under that licence during a water season or during any shorter period of take stated in the licence.

Local Management Plan (LMP) - Local management plans or rules are developed and signed off by rural water corporations, as a delegate of the Minister for Water.

A local management plan or local management rules are for an area with a Permissible Consumptive Volume and include appropriate tools such as trading rules, triggers for restrictions and monitoring requirements.

Metrological Assurance Framework – is part of the National Framework for Non-urban Water Metering and sets out the key requirements to make sure there is an acceptable level of confidence in meter performance.

Meter – is *'a measuring device or system (including its component parts) used to measure the volume of water passing through a closed conduit or open channel over a known period'* but does not include the measurement of flow in natural channels (see stream gauging).

Murray-Darling Basin Compliance Compact or **Compact** – An agreement designed to improve consistency, transparency and accountability in managing water resource compliance and enforcement across the Basin. All Basin states and the Australian Government committed to the Basin Compliance Compact in June 2018.

Non-compliant meter – is a water meter that does not comply with either an interim standard or AS4747.

Non-urban water metering – is water metering used as the basis for levying a charge and/or monitoring compliance with an entitlement and/or related resource management activities in a non-urban setting.

Non-urban metering does not include:

- stream gauging stations or groundwater infrastructure used for resource monitoring
- meters used in urban supply and distribution systems where water is treated to a potable standard.

Pattern approval – is a process for verifying the accuracy of a water meter, where the National Measurement Institute examines the pattern (design) of a meter prototype against the requirements of AS4747.

Registration farm dam licence –

A registration farm dam licence is an ongoing entitlement to take and use water from a catchment dam, spring or soak. Registration farm dam licences were issued between 1 July 2002 and 30 June 2003 based on historical use of water.

'Sleeper' water licence – is a water licence that is permanently inactive but can be reactivated. The term is often used interchangeably with 'dozer' water licences (see earlier definition).

Stream gauging – is the measurement in accordance with AS3778 of stream discharge (flow) past a given point on a watercourse for a range of flow height conditions, enabling calibration of the site and establishment of a rating curve (height-discharge relationship). A stream gauging station is the site for which the rating curve is established and is generally instrumented with a range of specialised equipment.

Stream Flow Management Plan (SFMP) - These plans are prepared for Water Supply Protection Areas (WSPA) declared by the Minister for Water in catchments where the water supply is considered under stress. They are developed by an advisory committee that includes Melbourne Water, local landholders, local diverters and relevant agencies, and are approved by the government and reviewed every five years.

Take and use licence (section 51 licence) - is a fixed term entitlement to take and use water from a waterway, catchment dam, spring, soak or aquifer. Each licence is subject to conditions set by the Minister and specified on the licence.

Telemetry - involves automatically recording data and sending it electronically from the meter to another place for monitoring and recording.

Validation – inspection and/or testing of the meter and installation by a certified validator to make sure there is enough confidence that it operates within the maximum permissible limits of error of ±5% allowed when installed.

Verification – a process or procedure for independently assessing the accuracy of a meter. This can be done in a laboratory to test the meter only, or in the field to test the meter performance in existing conditions.

Water accounting – the processes and procedures used to track water system inflows, outflows and storage volume changes.

Water take – water extracted under a licence or entitlement granted under the *Water Act 1989*.

Winter-fill licence – a take and use licence that only permits taking water from a waterway during the winter months, typically July to October.

Works licence – A licence that authorises the construction, alteration, operation, removal or decommissioning of any works on a waterway, or a bore, or a dam belonging to a prescribed class of dams.

For more information about water management terms in Victoria, see the Water Register's water dictionary at http://waterregister.vic.gov.au/water-dictionary

2 Executive Summary

In 2017, allegations of significant water theft and poor regulation in the northern part of the Murray-Darling Basin and compliance problems with water extraction and licensing systems in New South Wales led to several inquiries and reviews. The Commonwealth Government and all Basin states responded by agreeing to a Murray-Darling Basin Compliance Compact in June 2018 to improve transparency and accountability of water management systems and put more consistent compliance and enforcement practices in place. The Compact was endorsed by the Council of Australian Governments in December 2018.

Victoria's policy on non-urban water metering was revised in March 2020 to align with the requirements of the Murray-Basin Compliance Compact. The purpose of the Policy is to provide assurance that water taken under entitlements is accurately and comprehensively metered, considering risks to water resources and the relative costs and benefits of metering, so that water users and the community can be confident about Victoria's water resource management and accounting.

Water corporations are required to prepare, implement and maintain metering action plans that will detail how each water corporation meets the requirements in the Policy, providing clarity about metering, maintenance and data requirements in their respective jurisdictions.

The Action Plan presented here is Melbourne Water's Action Plan and along with the action plans being prepared by other Water corporations across Victoria underpins the Victorian Plan for non-urban water metering.

2.1 Summary of Metering at Melbourne Water

Melbourne Water has had a non-urban metering program since 1999 and therefore our current metering program consists predominately of replacement of meter assets nearing the end of their life and upgrades to comply with AS4747. As of July 2020, we have 786 non-urban meter installations linked to surface water licences within Melbourne Water's area of operations. Of the licensed sites, there are an additional 110 meter installations not owned by Melbourne Water. Section 7 of this report and specifically Table 3 provides further detail on our meter fleet.

By the end of June 2021, we will have 62% of total required meter fleet compliant with AS4747 with the remaining 188 meters scheduled to be upgraded to AS4747 by 2025.

2.2 Summary of Telemetry at Melbourne Water

Similarly to our metering program, we have been investing in our telemetry network for non-urban water management since 2013 and our current focus is of expansion of the network. As of July 2020, there are 268 telemetry installations linked to surface water licences within Melbourne Water's area of operations. Section 7 of this report and specifically Table 5 provides further detail on our telemetry fleet By the end of June 2021, we will have 58% of total required telemetry fleet compliant with Victorian Non-Urban Water Metering Policy with 195 telemetry dataloggers to be installed by 2025.

Our past investment and planned capital program for the next five years ensures that Melbourne Water is already well down the path of being compliant with the actions of the Compact and ensuring fair and consistent access to water for our customers.

2.3 Objectives of Action Plan

The Action Plan objectives reflect the objectives of the Victorian Metering Policy which aim to achieve the overarching aims of the Compact for improved water resource management and requirements under the Statement of Obligations. The Statement of Obligations issued under the Water Industry Act (1994) requires that water corporations providing non-urban water supplies or delivery services must prepare and implement Metering Action Plans that comply with the Victorian Implementation Plan for the National Metering Standards for Non-Urban Water Meters.

In addition to meeting the requirement of the Non-Urban Water Metering Policy, the Compact and our Statement of Obligations, this Action Plan aims to:

- Outline our commitment to improvements in metering and telemetry; and
- Maintain our focus on continuous improvement to remain at the forefront of effective water resource management

2.3.1 Outline of the Action Plan

This Action Plan has been structured to respond to the requirements of the Victorian Non-Urban Water Metering Policy following guidance documentation provided by DELWP. The Action Plan provides the necessary background to the funding of meter replacements so that Melbourne Water will be fully compliant with both AS4747 meters and telemetry by the end of 2025.

2.3.2 Capital Investment to meet Objections of Action Plan

Below is a summary of the Capital investment as per our 2021 Pricing Submission:

	2021/22	2022/23	2023/24	2024/25	2025/26	Totals
38 meter upgrade p.a	$0.204M	$0.204M	$0.204M	$0.204M	$0.193M	$1.006M
17 Stock meters[1] p.a	$0.050M	$0.050M	$0.050M	$0.050M	$0.050M	$0.252M
39 Data loggers p.a	$0.189M	$0.189M	$0.189M	$0.189M	$0.189M	$0.945M
Sub Total	$0.443M	$0.443M	$0.443M	$0.443M	$0.432M	$2.203M
Plus 10% contingency	$0.487M	$0.487M	$0.487M	$0.487M	$0.475M	$2.243M

Table 1: Capital funding summary

With the capital investment over the 2021 Pricing Submission, Melbourne Water will be fully compliant to the implementation program of the State Policy with the upgrade of 188 meters and the installation of 195 dataloggers by 2025.

A detailed breakdown of the capital costs can be found in located in Table 7 at Summary of the capital program.

[1] Meters required for new customers plus replacement of faulty contemporary meters

3 Introduction

3.1 Who we are

As a statutory authority owned by the Victorian Government, Melbourne Water works on behalf of the community to deliver a range of valuable services across the Greater Melbourne region.

To help make Melbourne a fantastic place to live, we supply affordable, high-quality water, provide reliable sewerage treatment and resource recovery, manage healthy waterways, provide integrated drainage management and flood resiliency, and maintain outstanding natural community spaces.

Every day we:

- manage water supply catchments
- treat and supply both drinking and recycled water products
- transfer, treat and recover resources from most of Melbourne's sewage
- manage waterways and major drainage systems in the Port Phillip and Westernport region.

3.2 Our vision and strategic direction

Melbourne Water's vision is to enhance life and liveability across Greater Melbourne and the surrounding region. We know that water is central to life. It sustains the natural environment we live in, the communities we value, and the economy we depend on.

We deliver on our vision through our three core pillars:

Healthy people – Providing safe, affordable, world - class drinking water and sewage treatment and supporting Melburnians to live healthy lifestyles.

Healthy places – Managing the impacts of climate change, building resilience to flooding across the Greater Melbourne region and partnering to deliver sustainable land and water management.

Healthy environment – Being innovative with resource recovery, reducing our emissions, improving the quality of waterways and engaging with the community on biodiversity and how to protect our natural assets.

Our values of care, integrity and courage are integral to the way we do business and treat one another. They are intrinsically linked to our vision of enhancing life and liveability and guide all that we do.

3.3 Our values

Our three core values guide what we do and how we treat each other, and are integral to the way we do business.

We believe in care, integrity and courage:

- **Care** - we put safety and wellbeing first at all times
- **Integrity** - we are open and transparent in everything we do
- **Courage** - we encourage each other to be confident and innovative.

3.4 Service Delivery - Waterways and Land group

The Waterways and Land group delivers drainage and waterways services to the community across the Port Phillip and Western Port region. The group forms part of Service Delivery and incorporates Delivery, Development Services, the South East and North West Regional Services teams, and the Flood Preparedness and Service Performance team. The Diversions team sits within the Service Performance team.

The objectives of the Waterways and Land group are to deliver efficient and effective waterways, drainage and land management services to our customers.

The Waterways and Land group is responsible for:

- Protecting the environment and providing a safe level of flood protection for communities
- Planning of infrastructure to service urban development
- Programs to protect and enhance the health of the region's rivers, creeks and wetlands.
- Services relating to diversion and water licenses
- On-ground delivery of waterways and land works activity

3.5 Our Operating Area

The Port Phillip and Western Port region covers some 13 440 km^2 and includes more than 8800 km of waterways, including rivers, creeks and estuaries. Of the seven catchments in the region, the Yarra, Maribyrnong, Dandenong and Werribee catchments drain into Port Phillip Bay, and the Western Port catchment drains into Western Port. The Bellarine Peninsula has two ephemeral streams that flow into Port Phillip Bay via Swan Bay. The Mornington Peninsula catchment has streams that flow into both Port Phillip and Western Port Bays.

The catchments in the Port Phillip and Western Port region have significant environmental, social and economic values. The waterways within these catchments are popular recreational destinations for Melbournians and tourists with over 100 million visits to our rivers, streams and creeks each year. However, our use of these catchments is harming water quality and threatening many of the aspects we value.

The Port Phillip and Western Port region is home to over 4.5 million people and boasts some of Victoria’s most productive farming lands, spectacular parks, picturesque landscapes and diverse natural ecosystems.

The activities and lifestyles of the region’s urban and rural residents and its thriving tourism industry are underpinned by the diversity and health of its natural resources.

3.6 Diversion Management in Melbourne Water

The Minister for Water has delegated Melbourne Water with the responsibility for managing the taking and use of water by private diverters from waterways and major drainage systems of the Yarra Catchment, lower Maribyrnong River and minor western tributaries of Stony, Kororoit, Laverton and Skeleton Creeks. We administer licensed diversions in accordance with the Water Act 1989, State Government policy and statewide diversions management practices. We also process and issue stormwater harvesting licences for the whole of the Port Phillip catchment on Melbourne Water drainage assets.

The effective management of the licensing function is essential to ensure the health of our waterways is protected while promoting the beneficial use of these water resources within sustainable limits. Streamflow Management Plans, local management rules, drought response plans and the Diversions Customer Charter have been developed by Melbourne Water in consultation with customers and other stakeholders. These plans and rules define the amount of water available within a catchment, the conditions under which it can be taken and the levels of service that will be delivered.

As of July 2020, the Diversion team manages 1763 licences to use water from farm dams and waterways in the Yarra catchment, lower Maribyrnong River, and minor western tributaries of Stony, Kororoit, Laverton and Skeleton Creeks. Water is mainly used for agricultural, industrial, commercial, domestic and stock purposes. The total number of 'take and use' licences (that is, licences for uses such as irrigation) is 1195 with a combined volume of 40,466.6 ML. The remaining 616 licences relate to farm dam registration licences. In addition to the 1763 licences mentioned above, we also manage 48 stormwater licences across the broader Melbourne Water area of operation.

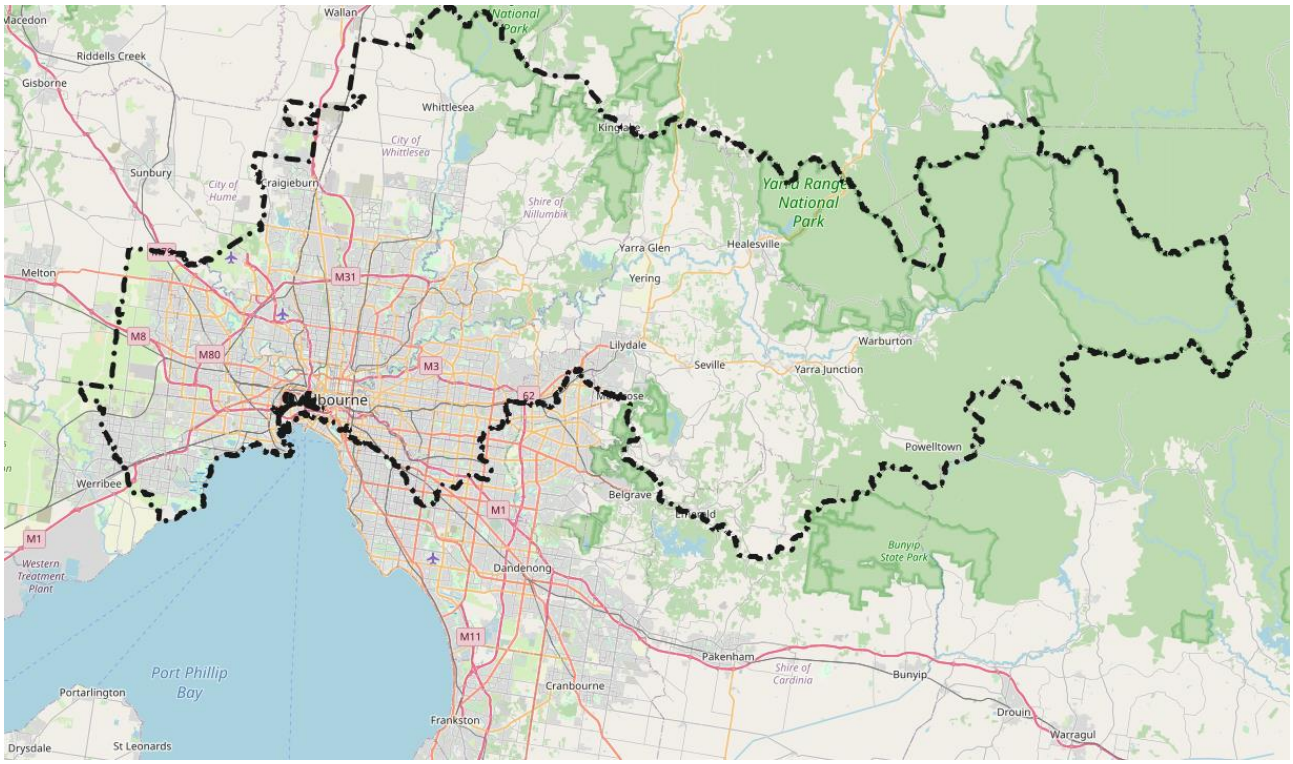


Figure 1: Melbourne Water's Diversion area of responsibility

4 Background

4.1 National Agreement on metering

State Governments signed the National Water Initiative[2] Agreement at the Council of Australian Governments' meeting on 25 June 2004 and agreed on actions for a more cohesive national approach to the way Australia manages, measures, plans for, prices and trades water.

Paragraphs 87 and 88 of this agreement specify requirements for national metering standards and a nationally-consistent framework for water metering and measurement.

A National Framework for Non-urban Water Metering Policy Paper (2009)**Error! Bookmark not defined.** (the 'National Framework') sets out the structure agreed to by state governments. It was designed to ensure that national metering standards provide an acceptable level of confidence that measurement performance under in situ conditions is within a maximum error of ±5%.

The National Framework defines non-urban water metering broadly to include measuring systems, devices and their component parts owned by entitlement holders, water service providers and jurisdictional governments, and used as the basis for levying a charge and/or monitoring compliance with an entitlement and/or related resource management activities in a non-urban setting.

Non-urban water metering excludes:

- stream gauging stations or groundwater infrastructure used for monitoring water resources, and
- meters used in urban supply and distribution systems where water is treated to a potable standard.

In 2017, allegations of significant water theft and poor regulation in the northern part of the Murray-Darling Basin and compliance problems with water extraction and licensing systems in New South Wales led to several inquiries and reviews. The Commonwealth Government and all Basin states responded by agreeing to a Murray-Darling Basin Compliance Compact in June 2018 to improve transparency and accountability of water management systems and put more consistent compliance and enforcement practices in place. The Compact was endorsed by the Council of Australian Governments in December 2018.

The Compact outlines actions to be carried out by all Basin states, as well as individual actions for each state. It reaffirms the commitment for metering to comply with Australian Standards, with the national standard AS4747 – Meters for Non-urban Water Supply[3] - as the relevant standard.

See Appendix A for a summary of policy and legislation relevant to non-urban water metering and Appendix C for an outline of how this policy is aligned with the Compact.

[2] National Water Commission http://nwc.gov.au/nwi

[3] AS4747 – Meters for Non-urban Water Supply, Standards Australia, 2009

4.2 Victoria's Policy for non-urban metering

Victoria's policy for non-urban water metering was revised in March 2020 to align with the requirements of the Murray-Basin Compliance Compact.

The purpose of the Policy is to provide assurance that water taken under entitlements is accurately and comprehensively metered, considering risks to water resources and the relative costs and benefits of metering, so that water users and the community can be confident about Victoria's water resource management and accounting.

This Policy replaces the 2014 non-urban metering policy and 2010 state-wide implementation plan. The Policy proposes some minor changes to align with current metering practices and the Murray-Darling Basin Compact however existing water corporation metering practices will largely continue.

The Policy sets requirements for water corporations with rural customers to prepare metering action plans.

This state-wide policy applies to non-urban water meters of water corporations with rural customers. The Policy states that:

1. All new or upgraded extraction sites are to be metered with an AS4747 compliant meter and meters on existing extraction sites are to be replaced at the end of their operational life with an AS4747 compliant meter;

2. This metering requirement can be varied by the water corporation in circumstances where the risks are manageable; costs are disproportionate to benefits; or the site requires hydrometric monitoring standards to be applied;

3. Water corporations must read meters on operational service points based on risk with a minimum standard of at least once a year on low volume or low risk customers, and at least two times per year for surface water winter-fill licences and more frequently on high risk meters;

4. Meters that comply with neither an interim/contemporary standard or AS4747 should be replaced by June 2025. In doing so water corporations should consider the circumstances the Policy provides for varying metering requirements; and

5. Metered water take is to be telemetered by June 2025, based on the water corporation's assessment of the full range of costs and benefits including benefits of stronger compliance. Water corporations may retain manual meter reading where telemetry is not viable (e.g. in valleys with poor reception or difficult sites), or an alternative technology can be applied.

Water corporations are required to prepare, implement and maintain metering action plans that will detail how each water corporation meets the requirements in the Policy, providing clarity about metering, maintenance and data requirements in their respective jurisdictions.

4.2.1 Policy Objectives

This State policy has the following objectives:

- To encourage comprehensive metering of non-urban water extraction in a way that is consistent with risks to water resources
- To provide for water take to be measured accurately and reliably
- To provide that meters installed are accurate and well-maintained
- The benefits of water measurement outweigh the costs
- To improve reporting by linking meter compliance data with water use data in the Water Register.

This policy replaces Victoria's non-urban metering policy of May 2014 and Victoria's state-wide implementation plan of 2009.

4.3 Categories of meters and the metering standards

The metering standards for non-urban water are specified for two main categories of meters:

- full flowing pipe meters; and,
- open channel meters

Figure 2: Full flowing pipe meter with Ajenti transmitter

The National Framework For Non-Urban Water Metering sets out a national Metrologic Assurance Framework to ensure an acceptable level of confidence in meter performance. Under this framework, the National Measurement Institute (NMI) and Standards Australia are responsible for developing and maintaining standards and uniform testing procedures, and the NMI is responsible for appointing measurement laboratories to undertake pattern approval and

initial verification testing, and for pattern approval of meters. This summarised in Table 2 below.

Requirement	Documents
Overall measurement requirement	Measurement Assurance Framework [2009]
Measuring instruments are fit for purpose	NMI M 10 for full flowing pipe meters [2010] and NMI M 11 for open channel meters [2009] Approved meters are called - pattern approved
Measurements are made correctly	AS 4747 – Sections 1, 2, 5 & 8 for full flowing pipe meters AS4747 – Sections 1, 3, 6 & 8 for open channel meters These standards include the requirement for duly qualified personnel for most tasks – called Certified Installers and Validators. AS4747 first edition was 2008 and the current 93rd) edition was in 2013]
Record-keeping to prove measurements are accurate	NMI retains records on meter testing for pattern approval AS4747 specifies the data to record

Table 2: Metering standards and the assurance framework for non-urban water metering

4.3.1 Availability of pattern approved meters

The National Measurement Institute (NMI) maintains the register of pattern approved meters and meters that are in the process of seeking pattern approval. Often a family of meters are approved in the one NMI document, and this covers a meter-model over a range of sizes.

The list of meters available can be found on Irrigation Australia's webpage: https://www.irrigationaustralia.com.au/certification/as4747-pattern-approved-meters

The Murray Basin Authority provides a useful summary of all the meters with pattern approval and meters in the process of seeking pattern approval on their web site. See https://www.mdba.gov.au/sites/default/files/pubs/Pattern-approved-non-urban-water-meters-04-2019.pdf

4.3.2 Availability of certified meter installers and validators

Irrigation Australian provides training and certification for Meter Installers and Validators and their website lists staff and contractors that are Certified Meter Installers and Validators. Two members of Melbourne Water's Diversion team are Certified Meter Installers and Validators with most meter installations and validations being sub-contracted to General Maintenance Hire Services (GMHS) via our Minor Field Services Panel.

5 Telemetry Specification

The following features are required in the data loggers:

General

- Capable of hourly logging totalising at 2400 Hrs the 24 previous logged data
- waterproof
- 6 months of data Capacity
- Capacity 100K or approx. 2,000,000 records
- battery life – as long as possible (10+ years)
- memory rewrite over old data to continuously record
- store memory if battery fails
- Enclosure rating IP – 67 or above
- Mounting system Integrated into enclosure
- Operating temperature -5 to +50 degrees Celsius
- Factory backup 24 months parts and labour guarantee for data loggers and ancillary equipment
- Low power usage
- Storage memory battery-backed
- Clock Accuracy 1 second/day @ 20 Degrees C
- Programmable logging frequency
- Download format to be compatible with all major spreadsheet CSV, ASCII, text, etc.
- External antenna (ability to install Yagi or directional antennae)
- E-mail, SMS sending method user selectable
- All external fittings, glands to be water & corrosion resistant.
- Data format i.e. 465/770/0019 03PFC00714 HH:MM:SS DD/MM/YY VVVVV
- Volume data as ML
- Ability to register .0001; .001; .01; 1.0 ML pulses or via Modbus technology on existing irrigation meter
- Datalogger is to be protected with a vandal proof cover where appropriate i.e. high traffic areas or where loggers could be compromised by livestock.
- Any cabling for dataloggers is to be suitably protected with a vandal proof conduit where appropriate i.e. high traffic areas or where loggers could be compromised by livestock.
- Ability to update datalogger onsite via on board keypad at the datalogger site

Power Supply

- Operating voltage Nominal 12 V DC
- Very Low Power consumption Charger type built in battery management system supporting an external battery
- Solar panel and/or mains charger if required

Inputs

- Input type counter
- Connection waterproof and corrosion proof

System Inputs

- External battery voltage, solar etc.
- Antennae

System Outputs

- Number of outputs up to 3
- Output Control via browser and/or SMS and/or timer alarms

System Alarms

- Number of alarms 1-3
- Type SMS and/or e-mail transmission
- Trigger User definable input and trigger point
- SMS / e-mail text 1 per alarm, user definable
- phone numbers 3 per alarm, user definable
- e-mail addresses 2 per alarm, user definable
- Alarm names User definable
- Alarms need to be relayed to appropriate Melbourne Water officer
- Zero usage

Telemetry Specifications

The following telemetry capability is required for the data loggers:

- transmission of data – daily
- consistent logger technology but transmission technology can vary (location dependent)
- power source (for transmission) battery
- mains if available
- solar power (preferred)
- ability to use IP Protocol
- ability to store telemetered data in Melbourne Waters existing Diversion Database
- ability to bring data into internet
- Satellite interface if required

Data quality

The following data quality features are required of the data collected by the data loggers:

- MWC will ground truth manual records against data logger records, and service provider will be required to investigate and rectify any data logger related problems.
- Service provider also to provide periodic calibration reports via a maintenance plan.

It is a requirement for the existing dataloggers that the data be managed and uploaded to a secure webpage and also into Melbourne Water's Diversion Database (.Net Framework 3.5, SP1 application) with services backed by our Microsoft SQL2016 server.

6 Water resource management areas

The majority of Melbourne Water licenced customers are in unregulated catchments and a small percentage (less than 5%) in the only regulated catchment being the Maribyrnong River. Within the unregulated systems we have 26 catchments. Of these catchments, 15 are managed under Stream Flow Management Plans, 8 under Local Management Plans with the remaining two managed under a Bulk Entitlement i.e. Yarra River (Lower) and (Upper).

As stated earlier the licences under management currently represents a water volume of 40,466ML. Therefore with 30,302ML currently metered this equates to 75% of the water volume available under all Melbourne Water issued licences being accurately metered.

Water Resource Source	Total volume allocated Metered Only (ML)	Number of full flowing pipe meters	Number of open-channel type sites
Surface water	27,521.3	709	-
Stormwater	2780.7	77	-
TOTAL	30,302	786	

A summary of numbers of meters in each of our catchments that we manage is given in Appendix D – Meter Fleet for each water resource management area.

7 Metering Scope

Melbourne Water commenced metering of its licensed diverters in 1999 when meters were installed on licence holders in the semi-regulated Maribyrnong River. Government policy made metering of new irrigation or commercial use licences mandatory from 2001 and introduced requirements for authorities to meter existing surface water licences of 10ML/yr or greater.

Melbourne Water adopted a greater flow threshold and has since metered active licence holders with annual volumes greater than 5ML/yr with the support of our customers. This threshold is consistent with our Diversion Policy and aims to ensure that a sufficient proportion of water use is accounted for to ensure effective resource management. The 10ML threshold may represent a suitable proportion of users in other parts of the state but the peri urban nature of Melbourne Water catchments warrants a lower threshold to achieve the same level of coverage. The metering program was completed in 2007. After this, Melbourne Water commenced a replacement program to upgrade existing meters to AS4747 compliant meters according to our Pricing Determination.

7.1 Summary of Meter Fleet

As of July 2020, there are 786 non-urban meter installations linked to licences within Melbourne Water's area of operations. The relationship between meters and number of licences or extraction points is variable as a licence may have multiple meters or conversely a meter may be shared by multiple licences. Of the licensed sites, there are an additional 110 meter installations which are utilised to record consumption but not owned by Melbourne Water.

Error! Reference source not found. summarises the licensed metered sites within M elbourne Water's area of operations as of July 2020.

Category	No.
1. AS4747 Compliant Meters	247
2. Additional AS4747 Compliant Meters by June 2021	60
3. Subtotal	307
4. Contemporary Meters [4]	188
5. Exempt Meters	291
Total	**786**

Table 3: Licensed meter installations by category

The 786 Melbourne Water meters range in diameters from 25 to 450 mm in size with the vast majority of the meters being in the 50 to 150 mm range. By the end of June 2021, we will have 62% of total required meter fleet compliant with AS4747 meters with the remaining 188 meters scheduled to be upgraded to AS4747 by 2025.

[4] To be upgraded to AS4747 compliant meters as per our Capital program by 2025

7.2 Current meter fleet detailed

		25mm	40mm	50mm	65mm	80mm	100mm	125mm	150mm	200mm	250mm	300mm	400mm	450mm	Unknown	Total
Compliant Meters	Existing Compliant Meters to AS4747					64	76		35	11	3	0	0	0	0	189
	Accurate meter planned - will be AS4747 during 20/21			2		14	27	0	13	3	1	0	0	0	0	60
	Existing Compliant Meters - outside scope (includes other Authorities and Private meters)	0	0	41		2	9	0	2	0	1	0	3	0	0	58
	Total AS4747 by 30/6/2021			43	0	80	112	0	50	14	5	0	3	0	0	
														Compliant		**307**
Contemporary Meters	Accurate meter required	0	0	0		49	62	1	32	2	1	0		0	0	147
	Exempt - outside scope (includes other Authorities and Private meters)	0	0	0		0	0	0	0	0	0	0		0	0	0
	Exempt - low use	0	0	0		10	25	0	13	0	0	0		0	0	48
	Exempt - high cost	0	0	0		0	0	0	0	0	0	0		0	0	0
														Contemporary		**195**
Exempt Meters	Accurate meter required	0	0	40	0	0	1	0	0	0	0	0	0	0	0	41
	Exempt - outside scope (includes other Authorities and Private meters)	4	1	37	1	25	21	0	4	2	0	3	0	2	10	110
	Exempt - low use	1	0	96		13	21	0	2	0	0	0	0	0	0	133
	Exempt - high cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		5	1	173	1	38	43	0	6	2	0	3	0	2	10	
														Exempt		**284**
Unmetered	Accurate meter planned															9
	Exempt - low use															582
	Exempt - high cost															1
																592

Table 4: Detailed breakdown of meter fleet

The number of meters above are the sums of nominal pipe diameters. Each meter has been coded as per Table B3 - Non-urban water meter compliance codes and Table B4 - Non-urban water meter requirement codes

7.3 Exemptions from Action Plan

The Victorian Non-Urban Water Metering Policy has exempted a number of extraction sites from the provisions of the National Framework including when:

1. the take is for domestic and stock purposes
2. the cost of metering would significantly outweigh the benefits, including, but not limited to:
    a. where the site is not in use
    b. the low frequency or low annual volume of take
    c. excessive costs imposed by site conditions including water quality
    d. adequate water measurement is provided by bulk water metering, or
    e. The site is in the bottom 5 per cent of water taken (based on use) within a water resource management area.

    In these cases:

    a. the reasons must be documented and
    b. if no meter is installed, there is a documented method for estimating the volume of water taken [5]
3. the take is from an irrigation drainage system
4. the take is authorised under a registration farm dam licence
5. a suitable pattern-approved meter is not available e.g. open channels
6. the site requires stream gauging methods to be applied

7.3.1 Melbourne Water's Exemptions from Action Plan

In Melbourne Water's area of operation we have adopted the following exemptions :

1. Exempt - outside scope (meter sizes <80mm and includes other Authorities and Private meters)
2. Existing Compliant Meters - outside scope (meter sizes <80mm and includes other Authorities and Private meters)
3. Exempt - low use (sleepers, no usage through current meter or unmetered sites)
4. Exempt - high cost (open channel licence where a suitable pattern-approved meter is not available)

Summary charts of unmetered sites are given in Appendix E – Summary Charts of Unmetered Sites.

[5] Melbourne Water does not deem usage against an entitlement which is the practice of estimating usage when a site is unmetered

7.4 Types of Non-Urban Meters Installed

Melbourne Water has the following irrigation meters installed:

1. **Mechanical Pulse Meters** - Can be converted for electronic / remote readout capability by simply removing a plastic plug and fitting a magnetically operated signal sensor and cable. Not compliant to AS4747 - Meters for non-urban water supply.
   - Elster R2000 -This is an inline helical-shaped rotor irrigation meter.
   - Elster Commercial Single Jet (CSJ) water meter – small paddle wheel that extends below the surface of the meter body and rotates perpendicular to the flow.
   - Elster Helix3000 – This is in-line Woltmann helical rotary type meter that has pulse output capability as standard
   - Arad WST – compliant to AS4747 - LINK

2. **Electromagnetic Pulse Meters** –The meter has magnetic field that surrounds the internal wall of the meter housing.
   - Elster Q4000 – LINK . Not compliant to AS4747
   - Elster Q4000b – LINK . Not currently compliant to AS4747
   - Krohne Waterflux 3070 & 3070C – compliant to AS4747. LINK
   - Arad Octave - compliant to AS4747. LINK

3. **Electromagnetic Modbus Meters** –
   - Siemens Mag8000 Modbus RTU - compliant to AS4747. This meter is fully potted and has Modbus R485 capability with a 5m length of Industrial Ethernet FC TP Standard cable. See LINK
   - Krohne Waterflux with Modbus – compliant to AS4747. See LINK

Figure 3: Siemens Mag8000 meter with Ajenti transmitter

8 Telemetry

Telemetry involves automatically recording data and sending it electronically from the meter to another place for monitoring and recording.

The benefits of telemetry includes :

- allowing customers to assess their current water use
- assisting to improve occupational safety,
- detecting metering faults and failures earlier,
- improving knowledge on customer water usage trends,
- processing water trades faster,
- resolving customer complaints and detect breaches of limits on take.

8.1 Summary of Telemetry Fleet

As of July 2020, there are 268 telemetry installations linked to licences within Melbourne Water's area of operations.

Table 5: Telemetry installations by category below summarises the telemetry installations within Melbourne Water's area of operations.

Category	No.
1. Pulse (Ajenti10 or Transmitter) - existing	160
2. Modbus (Transmitter) - existing	67
3. Datalogger being installed by 30/6/21	41
4. Planned - future CAPEX [6]	195
Total	**463**

Table 5: Telemetry installations by category

By the end of June 2021, we will have 58% of total required telemetry fleet compliant with Victorian Non-Urban Water Metering Policy with 195 telemetry dataloggers to be installed by 2025. A more detailed spreadsheet of our current telemetry fleet is given in Table 6: Detailed breakdown of telemetry fleet .

[6] To be installed as per our Capital program by 2025

8.2 Current Telemetry Fleet

As of July 2020, the current Melbourne Water datalogger fleet is as follows

	Meter Size														
	25mm	40mm	50mm	65mm	80mm	100mm	125mm	150mm	200mm	250mm	300mm	400mm	450mm	Unknown	Totals
None	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Not required	5	0	134	1	63	78	0	24	2	0	3	2	1	10	323
4-20mA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pulse (Ajenti10 or Transmitter)	0	1	21	0	32	67	0	31	6	1	0	0	1	0	160
Modbus (Transmitter)	0	0	16	0	27	21	0	2	1	0	0	0	0	0	67
Planned - future CAPEX	0	0	42	0	42	61	1	36	8	4	0	1	0	0	195
Transmitter being installed by 30/6/21	0	0	3	0	13	15	0	8	1	1	0	0	0	0	41

Unmetered	None	584
	Datalogger planned	8

Table 6: Detailed breakdown of telemetry fleet

The number of dataloggers above are the sums at nominal pipe diameters. Each datalogger has been coded as per Table B5 - Non-urban water meter Telemetry Codes adopted by Melbourne Water

8.3 Telemetry Exemptions from Action Plan

In Melbourne Water's area of operation we have adopted the following exemptions :

1. Exempt - outside scope (meter sizes <80mm and includes other Authorities and Private meters. Manual meter reading will be maintained where telemetry is not viable (e.g. in valleys with poor reception or difficult sites)

2. Existing Compliant Meters - outside scope (meter sizes <80mm and includes other Authorities and Private meters)

3. Exempt - low use (sleepers, no usage through current meter)

8.4 Current Telemetry Fleet

Melbourne Water uses Hydro Tasmania – Entura's Ajenti™ Data Management System (ADMS). The ADMS can bring together multiple sources of data into a single cloud-based repository where customers can view and analyse their own data. We currently have the following Entura products installed:

8.4.1 The Ajenti 10

The Ajenti 10 has on board a SD Card for storing the program and data, a private network Data Sim for transmitting data, a 10W or 20Watt solar panel to provide adequate solar input in the difficult light conditions at some sites, a 12v lead acid battery for power storage of up to two weeks of low sunlight, a pole and box for attaching peripherals and instrument box. In many cases due to low light conditions the installation can be some distance away from the water meter to obtain adequate sunlight. This results in long cable runs for returning the pulses from the water meters. Historically a number of sites suffer from poor sunlight and require site visits to replace batteries and reprogram SD cards corrupted during low power brownouts.

Figure 4: Ajenti10 datalogger

The Ajenti 10s require a medium to high technical background for installation (due to difficult sunlight conditions) and medium technical ability to maintain.

8.4.2 The Ajenti transmitter and Ajenti Gateway

It was deemed a low cost, easy to install and maintain service was preferred over the Ajenti 10 where possible. The scope was to remove high level, technically challenging services away from the water meter to a centralised, easy to access location to be maintained by Entura. This brought about the Ajenti transmitter and gateway. The transmitters were designed to provide data more frequently, requiring less power, on smaller infrastructure whilst being simple enough to be operated and maintained by our own field staff.

8.4.3 Ajenti Transmitter

Figure 5: Ajenti10 transmitter

The Ajenti transmitters feature a cast enclosure with a small integrated solar panel and a stainless steel bracket and whip antenna. The transmitter can be installed at the water meter in most situations on a star picket or alternatively on a shed or other infrastructure in low light locations. The transmitters have two pulse inputs and log data on the log interval and transmit on the poll interval. Unlike the Ajenti 10s the transmitter has no on board memory for historic logging or a SIM for telemetry simplifying the setup and maintenance. The transmitter while sleeping continues accumulating pulses between logs and sends the water meter/s value/s along with condition monitoring details back to the gateway via a radio mesh network.

8.4.4 Ajenti Gateway

Figure 6: Hub station at Yarra Glen

The Gateway collects and stores all the values across the network and uploads them to the Ajenti Data Management System (ADMS) throughout the day. The Gateway consists of an Ajenti receiver, a data logger, a sim card, a cantilevered mast and solar panel. Due to the high level of technical knowledge required to install, operate and maintain the gateway is operated and maintained by Entura to ensure uninterrupted access to client's water meter data.

<u>Existing Melbourne Water Networks</u>

Currently Melbourne Water has four new Ajenti transmitter networks with four gateway sites at Head Road, Silvan Reservoir, Gembrook and Yarra Glen. The networks are not yet at capacity with up to 100 transmitters able to connect to each gateway.

9 Levels of Service for customers, government and regulators

In our Diversion Customer Charter, under *Section 4.9.1 - Melbourne Water Maintenance Obligations*, it states the following in regards to metering:

Meters installed on customers pumping equipment and offtakes remain the property of Melbourne Water and Melbourne Water is responsible for maintenance and replacement as necessary of such meters. This obligation includes any ancillary equipment connected with the meter such as data loggers installed by Melbourne Water or its contractors.

Meter readings and inspection of meter condition will be undertaken on an annual basis as a minimum. Servicing and maintenance of meters will be undertaken in response to any detected faults following inspection or at intervals not exceeding every 3 years. Meter readings, servicing and maintenance may be carried out by Melbourne Water's approved contractors.

Any works undertaken by Melbourne Water or its contractors will be notified to the landowner and will be undertaken in consideration of any requirements of the landowner in respect to:

- Access into and through the property.
- Protection and minimising disturbance to people, livestock, crops, assets and the land in general

With Hydro Tasmania – Entura's ADMS system, customers have the ability to access their personal datalogger data on a portal using an unique username and password.

Melbourne Water reports annual consumption via our existing SQL database to the Victorian Water Register (VWR). This can be adjusted to more frequent intervals if required.

10 Meter Lifecycle Management

10.1 Overview of meter lifecycle management

Asset management is undertaken across Melbourne Water using the Maximo Asset Management System software. Meter details have been uploaded into Maximo to enable the creation of work orders against assets and also programmed maintenance i.e. meter validations every three years.

The asset lifecycle at Melbourne Water is shown below:

Procure / Construct / Commission

A Business Needs Identifier (BNI) is prepared when required using our capital management system, Projects Online and a project functional requirement document is developed in Maximo. These documents specify the requirements for both metering and telemetry works which are then installed through our internal works delivery teams.

Operate and Maintain

All meters are on programmed maintenance involving regular inspections and validations. Break down and corrective maintenance occurs when an issue is identified by a staff member or a customer and all meters are maintained consistent with maintenance requirements specified by the meter provider.

Dispose / Replace

For our meters we assume an operating life of up to 15 years when appropriate maintenance is in place and our rolling capital program ensures meters are replaced towards the end of their operational life.

10.2 Meter selection

10.2.1 General selection requirements

The following lists the formal policy and procedures documentation of Melbourne Water used in non-urban water metering.

1. Diversions Management Policy, December 2019
2. Waterways Enforcement Policy, June 2020
3. Diversion Water Trading and Transfer Policy, January 2018
4. DELWP Non-Urban Metering Policy, March 2020
5. Diversions - Procedure for Stormwater Harvesting Applications, September 2018

6. Manufacturer's specifications for each individual meter type.

The risks to Melbourne Water business associated with non-urban metering have historically been considered as low in relation to its risk management policy.

The meters procured under this arrangement are aimed at standardisation of the meter fleet, predominantly around the use of Siemens Mag8000 electromagnetic flowmeters or equivalent AS4747 compliant meter. This arrangement has led to simplified procurement and maintenance as a result of a common product specification.

10.2.2 Full flowing pipe meter availability

Melbourne Water currently installs the Siemens Mag8000 Modbus RTU that is compliant to AS4747. We fully pot the internals of this meter to protect the internals against vibration and moisture ingress. This meter has Modbus R485 capability and also has a 5m length of Industrial Ethernet FC TP Standard cable. This meter can also be connected to mains power if available.

10.3 Meter installation

Meter installations, replacement and maintenance is presently managed through Melbourne Water's Delivery team who is responsible for the delivery of all Maintenance and Low Risk Capital activities and projects across the Melbourne Water region.

10.4 Meter maintenance

Maintenance of meters are managed via creation of Work Orders on Maximo and is also managed through the Melbourne Water's Delivery team and our Minor Field Services panel. The Diversion team uses General Maintenance Hire and Services Pty Ltd (GMHS) who are a certified meter installer and validator and an approved contractor on our Minor Field Services panel.

10.5 Meter validation

For all our meter assets, we run meter validations via programmed maintenance approximately every three years via Maximo. This program is scheduled within a catchment and ensures that all meters are validated according to AS4747. If we find an existing meter is not operating then we will attempt to replace it with an AS4747 meter depending on available budget and risks assessments. These programmed maintenance costs are recovered via licence fees to our customers. We do our validations using the IAuditor app and our subcontractor completes a pre-populated form with a checklist adopted from AS4747. This validation form also has photos imbedded into the inspection forms.

The Action Plan relies on the Diversions Team staff being accredited to undertake this activity along with contracted maintenance staff. Training of appropriate personnel has already been undertaken in this regard.

10.6 Meter verification

Re-verification of meter accuracy is a critical aspect of the metrological assurance program and requires the use of either in situ or laboratory testing to confirm that the meter accuracy complies with the requirements of the National framework. The Plan for Victoria is based on a State wide approach to meter re-verification, avoiding otherwise the need for duplication and re-verification testing elsewhere.

Under the arrangements to hand, re-verification of meters is to apply to 0.2% of the total meter fleet across Victoria annually. This translates to re-verification of approx. 1 meter out of Melbourne Water's adopted meter scope each year.

Meter re-verification is to be undertaken by third parties using accredited systems.

10.7 Telemetry

Melbourne Water subcontracts our datalogger maintenance to an external provider, currently Hydro Tasmania - Entura. This includes a six weekly service inspection plus data and hosting charges.

10.8 Disposal and decommissioning plan

As meters get upgraded to pattern approved meters, they are decommissioned from our existing database and asset system i.e. Maximo.

10.9 Bulk Water Measurement

Meter installations that apply to Bulk Entitlements (BE's) have been excluded from the metering scope of this Action Plan. Non-urban meters used for BE compliance must comply with the National Framework however, Victoria has excluded specific actions in relation to BE's from the Victorian Plan as the existing BE metering programs are being rolled out separately, in accordance with the separate provisions of Section 43 (g) of the Water Act 1989.

Melbourne Water has existing metering programs to show how we comply with their bulk entitlements, in line with Guidelines for the Development of Bulk Entitlement Metering issued by the Minister for Water in 2009. We publicly disclose take under bulk entitlements in annual reports tabled in Parliament and the yearly Victorian Water Accounts.

The Water Resources team in Integrated Planning have addressed Melbourne Water's requirements in respect to BE metering outside of this Action Plan.

10.10 Metering of domestic and stock use

All domestic and stock extractions have been exempted from metering scope of this Action Plan. All our D&S licences have an entitlement volume of 2 ML and are well below our meter threshold of 5ML.

11 Improvement plan

11.1 Improvements to meter and telemetry fleets

Melbourne Water will continue to upgrade our meter fleet with Siemens Mag8000 with RS 485 Modbus RTU.

The benefits of a Modbus meter together with a datalogger includes the following :

1. The datalogger communicates directly to the meter instead of calculating the meter reading.

2. Modbus allows us to transmit meter serial number, meter battery life, forward flow, reverse flow and total flow.

11.1.1 Internet of Things (IoT)

The Internet of Things (IoT) is a relatively new technology that utilises inexpensive sensors, cloud based computing and the internet (for the network) for monitoring of processes and asset condition.

We are planning to trial the installation of IOT devices on various irrigation meters in our area of operation during 2020/21. These will be installed where our current transmitter network is not viable (e.g. in valleys with poor reception or difficult sites).

11.2 Improvements to management processes and systems

11.2.1 Customer Portal

We are currently developing a Diversion's Customer Portal to improve customer accessibility to their real time consumption data as well as other improvements.

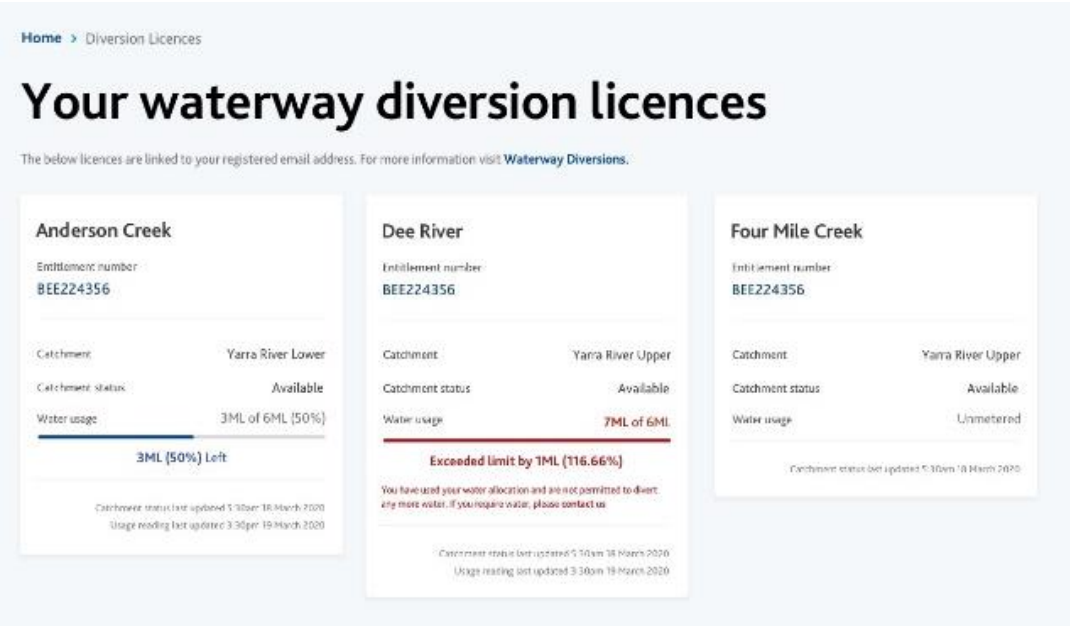


Figure 7: Draft Diversions Customer Portal

11.2.2 Proposed Changes to Diversion Database

11.2.2.1 Meter and Telemetry Codes

In our Diversion Database, we plan to include the codes required by Non-Urban Water Metering Policy (Table B3 - Non-urban water meter compliance codes, Table B4 - Non-urban water meter requirement codes and Table B5 - Non-urban water meter telemetry codes adopted by Melbourne Water This would be a series of pull down fields / codes under the current Remote Meter Type field on existing database, see image below.

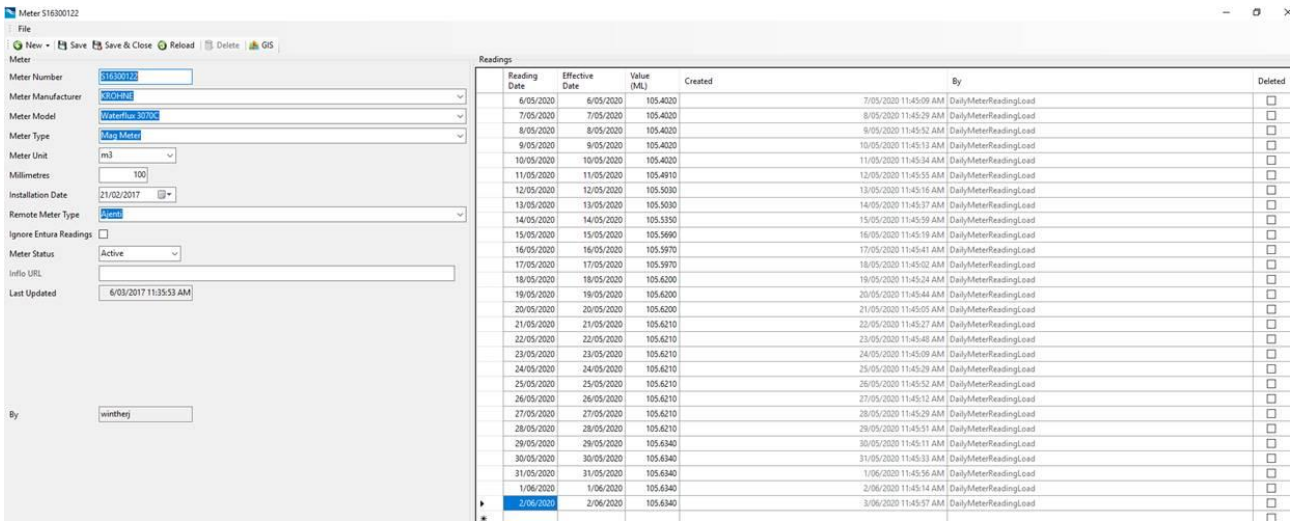


Figure 8: Current Diversion Database Meter Table

These new meter and telemetry codes will enable consistent State-wide reporting.

11.2.2.2 Upgrade Meter Table to allow Modbus Data Input

Allow direct feed of the following from Modbus meters :

- meter battery life,
- forward flow,
- reverse flow,
- total flow

11.2.2.3 Optimisation of Diversion Database.

Melbourne Water's Diversion Database is a .Net Framework 3.5, SP1 application with services backed by our Microsoft SQL 2016 server. The .NET Framework is a software development framework for building and running applications on Windows.

This database is over 10 years old and is currently supported by our Information technology team. Upgrade options are being considered including upgrading the existing database to Azure SQL Database which is built for the cloud. This system can been accessed from multiple platforms i.e. Windows and IOS. This could allow for extension of mobile computing for remote capturing of meter data. Power BI could then be used to provide more accurate and timely reports to DELWP and other agencies as required.

11.3 Forward look capital program

11.3.1 Metering

Our current Meter fleet is detailed in Table 4: Detailed breakdown of meter fleet.

The table below gives the forecast to 2025 of non-urban meters to be upgraded to AS4747 compliant meters. 50mm meters are technically exempt under the state policy yet our practice is to replace any 50mm meters with an AS4747 compliant meter.

	50mm	80mm	100mm	125mm	150mm	200mm	250mm	Subtotal
Contemporary – Accurate meter required	0	49	62	1	32	2	1	147
Exempt – Accurate meter required	40	0	1	0	0	0	0	41
Totals	40	49	64	1	31	2	1	188

Details of the planned capital program for meters is given in Summary of the capital program.

11.3.2 Telemetry

Our current telemetry fleet is detailed in Table 6: Detailed breakdown of telemetry fleet .

The table below gives the forecast to 2025 for telemetry sites to be installed.

Existing Meter Size	50mm	80mm	100mm	125mm	150mm	200mm	250mm	400mm	Total
Planned - future CAPEX	42	42	60	1	35	8	4	1	195

Details of the planned capital program for telemetry is given in Summary of the capital program.

12 Financial Summary

12.1 Funding Strategy

Our diversions management program is directly funded by all revenue from licence, volumetric and application fees. The program ensures allocations are managed fairly and sustainably between licence holders as well as the environment, through activities to:

- install, monitor and maintain flow-recording meters and telemetry for real-time data on licence holders' properties
- maintain a network of stream gauges to provide accurate and timely streamflow data
- undertake compliance and enforcement activities and legal action where required
- comply with relevant statutory and legal obligations.

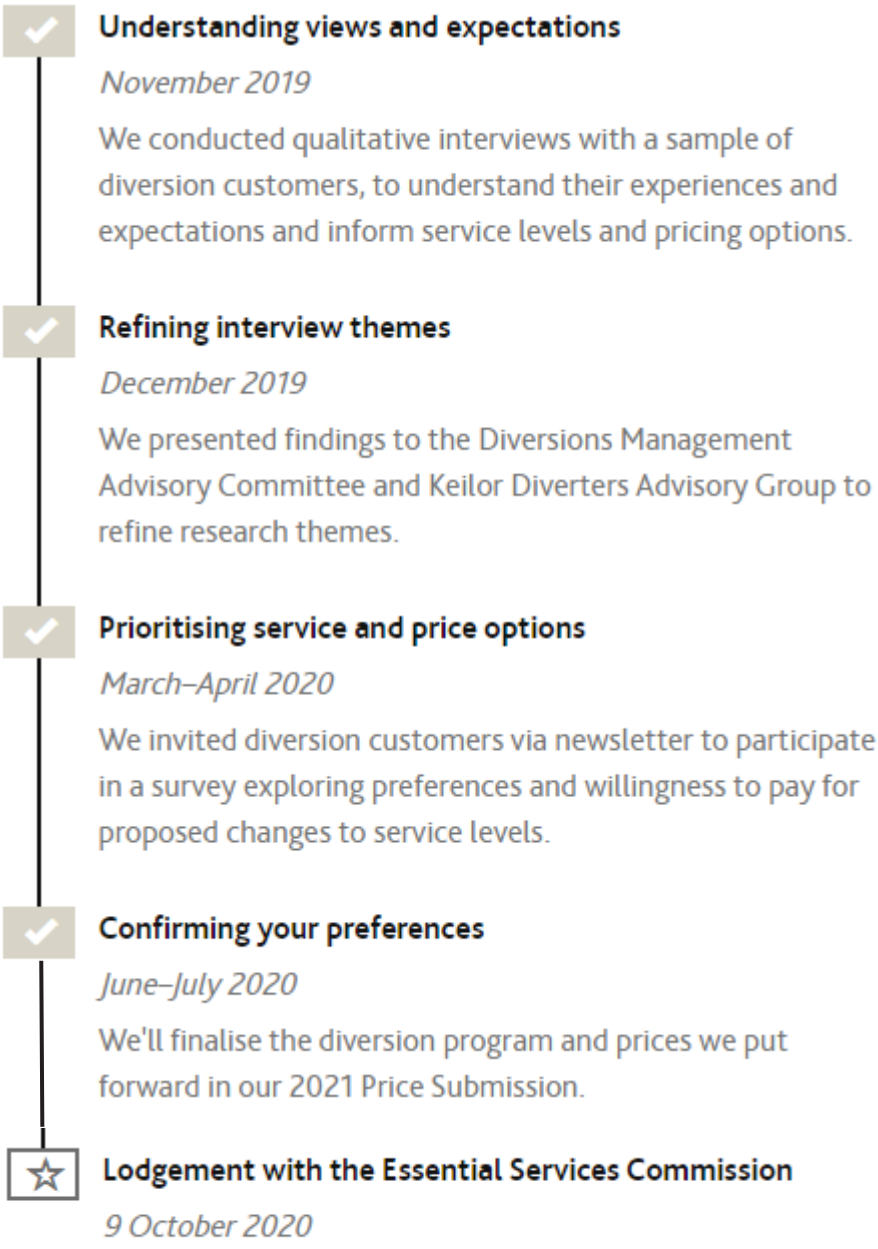
12.1.1 Prices and services for 2021–26

Based on diversion licence holder feedback, we will be adopting the 'Standard package' of services from the four options presented. This maintains current customer service levels, while expanding the metering program to meet the Victorian Government's Non-Urban Metering Policy and support reasonably-priced, fair and equitable access to water for all.

12.1.2 Customer engagement on proposals

The timeline below outlines the engagement approach adopted to engage with our customers about the 2021—26 Price Submission. Following customer interviews and discussions with advisory committees, licence holders were invited to complete an online survey to indicate their preferred service package from four options shown below. The chosen option will be put forward in our Price Submission to the Essential Services Commission, Victoria's independent regulator, who will review this as part of their price setting process.

12.1.3 Timeline for Diversion 2021 Price Submission



The four proposals were informed by interviews with licence holders to understand their priorities and views on our current activities, the findings of which were shared with the Diversions Management Advisory Committee and Keilor Diverters Advisory Group in December 2019.

Standard package

Continuation of current service levels to meet Customer Charter, PLUS:

- Meter installation to comply with the Victorian Government's Non-urban Metering Policy, and covering approximately 75% of our active diversion licences

This package received 56% of first preference votes and 33% of second preferences.

Increased customer service and compliance package

All activities included in the Standard package, PLUS:

- Additional resources to exceed Customer Charter response times
- Greater availability of diversions staff
- Increased compliance presence, including active management of medium- to high-risk customers and enforcement focus

Expanded metering package

All activities included in the Standard package, PLUS:

- Expansion of metering program to include all licenses with allocations of 2ML and greater, covering 100% of our active diversion licences and exceeding the requirements of the Victorian Government's metering policy

Increased customer service, compliance package and expanded metering package

All activities included in the following packages:

- Standard package
- Increased customer service and compliance package
- Expanded metering package

12.2 Summary of the capital program

As per our Pricing Submission 2021, the metering and telemetry capital costs have been adopted (adopting capital costs as of March 2020) :

		21/22		22/23		23/24		24/25		25/26		TOTAL	
	Unit cost	# of meters	Estimated cost	# of meters	Estimated cost	# of meters	Estimated cost	# of meters	Estimated cost	# of meters	Estimated cost	# of meters	Estimated cost
Existing meters to be upgraded	$5,212.77	47	$245,000	47	$250,966	47	$257,077	47	$263,337	47	$269,749	235	$1,286,128
New meters for new applicants plus meters for stock	$2,717.65	17	$46,200	17	$47,325	17	$48,477	17	$49,658	17	$50,867	85	$231,000
Data loggers	$1,432.43	74	$106,000	74	$108,581	74	$111,225	74	$113,933	74	$116,708	370	$556,447
Total			$397,200		$406,872		$416,779		$426,928		$437,323		$2,085,102
plus 10% contingency			$436,920		$447,559		$458,457		$469,620		$481,056		$2,293,612

Table 7: Preliminary Capital Costs

However the above capital costings were updated after receiving recent prices for our meter and telemetry providers.

The following table provides the most up-to-date estimates from our providers :

		2021/22		2022/23		2023/24		2024/25		2025/26		TOTAL	
	Unit cost	# of meters	Estimated cost	# of meters	Estimated cost	# of meters	Estimated cost	# of meters	Estimated cost	# of meters	Estimated cost	# of meters	Estimated cost
Existing meters to be upgraded	$5,355.37	38	$203,504	38	$203,504	38	$203,504	38	$203,504	36	$192,793	188	$1,006,810
New meters for new applicants plus meters for stock [7]	$2,959.63	17	$50,314	17	$50,314	17	$50,314	17	$50,314	17	$50,314	85	$251,568
Data loggers	$4,845.00	39	$188,955	39	$188,955	39	$188,955	39	$188,955	39	$188,955	195	$944,775
Sub Total			$442,773		$442,773		$442,773		$442,773		$432,062		$2,203,153
plus 10% contingency			$487,050		$487,050		$487,050		$487,050		$475,268		$2,423,469

Table 8: Final Capital Costs

This new costing has a shortfall $129,856 from our adopted Pricing Submission 2021 capital costings.

This shortfall will be addressed by undertaking the following :

1. Some meter sites will be updated using stock meters and paid under our operating budget
2. With the proposed IOT device being installed, it is anticipated that there will be a reduction of the 195 datalogger required to be updated by 2025/26.

[7] Some of these meters will be used to replace faulty meters under our Opex budget. This will reduced the capital replacements numbers

12.3 Operational Budgets

As per our Pricing Submission 2021, the metering and telemetry operating costs have been adopted as follows :

	2021/22	2022/23	2023/24	2024/25	2025/26	Totals
Maintenance of meters i.e. validations etc.	$160,000	$160,000	$160,000	$160,000	$168,100	$972,100
Telemetry oncosts i.e. data hosting etc.	$77,556.6	$79,495.5	$81,482.9	$83,520.0	$85,608.0	$495,411.3
	$237,556.6	$239,495.5	$241,482.9	$243,520.0	$255,848.2	$1,467,511.3

Table 9: Operating Costs for Meters and Telemetry

13 Data management, analysis and reporting

13.1 Status of current data management, analysis and reporting

Melbourne Water's Diversion Database holds the water entitlements in a primary and local database and allows the administration of these licences for operational purposes. The software is a Microsoft.NET application with a SQL database in the background.

Normally this application is the first point of call for enquiries and Victorian Water Register (VWR) applications. When an entitlement is modified or added on the VWR, the same information is uploaded automatically on a daily basis into the Diversion Database. Correspondence groups (used for mailing etc.), billing, metered usage, enforcement, and manual/automated task assignment are maintained by the team.

Some meter readings are collected automatically rather than being entered manually. These automated meter readings are uploaded daily via email to the Diversion database. Meter readings can also be inputted manually in the database.

The database produces the following automatic tasks:

- Correspondence Group changed
- Correspondence Group created
- Daily Consumption Breech
- Licence Exceeded Annual Allocation
- Missing Service points
- Negative Consumption
- No take day alerts
- Off period consumption

From the Diversion database, we use either Crystal Reports or Tableau to produce various reports.

Maximo is the asset management system used by Melbourne Water staff to manage our assets and is part of our Asset Management Information System (AMIS) which also includes GIS. All our diversion meters including paths to these sites are all plotted on layers on our GIS system. From Maximo, we arrange for Works Orders and Programmed Maintenance i.e. Meter Validations on our meter fleet.

TechOne is Melbourne Water's financial and procurement management system used to capture and report on all financial activities and produce financial & management reports. The Diversion database generates a spreadsheet to assist the Finance team to produce annual invoices on TechOne.

13.2 Uploading data to DELWP's Central Meter database

In regards to the process of daily uploading data to DELWP's central meter database, this will require major updates to the current system. This enhancement has been requested to our IT team. However this will depend on prioritisation of all IT projects across the business.

Melbourne Water have both positive and negative consumption meters to determine usage. There may be also multiple positive consumption and negative consumptions meters commissioned against an allocation to determine the actual consumption. To further complicate matters, sometimes there is one meter installed that is used to determine the actual consumption against an all year licence and a winterfill licence. A customer may have two licences commissioned to one meter. Also our Diversion database allows us to create or modify entitlement groups which are a number of entitlements that are grouped allowing a pooled volume or a way of seeing the total volume and consumption that a licence holder may have. We also record non-consumptive meter reads for our records.

13.3 Meter fleet analysis

The following is a summary of the catchments in each of our water resource management areas.

Water resource – Unregulated

1. Cockatoo Creek and Shepherd Creek – SFMP
2. Darebin Creek – LMP
3. Diamond Creek – LMP.
4. Dixons Creek - SFMP
5. Don River – SFMP
6. Gardiners Creek – LMP
7. Hoddles Creek – SFMP.
8. Kororoit Creek – LMP (Western)
9. Little Yarra River – SFMP
10. McCrae Creek – SFMP
11. Merri Creek - LMP
12. Moonee Ponds Creek –LMP
13. Mordialloc [8]
14. Mullum Mullum Creek – LMP
15. Olinda Creek (Lower) – SFMP
16. Olinda Creek (Upper) – SFMP.
17. Pauls Creek – SFMP
18. Plenty River – SFMP
19. Steels Creek – SFMP
20. Stringybark Creek (Lower) – SFMP
21. Stringybark Creek (Upper) – SFMP
22. Wandin Yallock Creek – SFMP
23. Watsons Creek– LMP
24. Watts River – LMP
25. Woori Yallock Creek – SFMP.
26. Yarra River (Lower) – Bulk Entitlement
27. Yarra River (Upper) – Bulk Entitlement.

Water resource – Regulated

28. Maribyrnong River – Bulk Entitlement

A summary of numbers of meters in each of these catchments is given in Appendix D – Meter Fleet for each water resource management area.

[8] Stormwater harvesting licences only in Bunyip Basin

13.4 Performance Measures

Below are the performance measures as per this Action Plan :

KPI	KPI Level	How It's Measured	Frequency	By Whom
D1. Delivery and installation of 60 meters & 41 dataloggers by 2021	100% of goods installed by 30/6/2021	Count of meters and dataloggers installed	End of Contract	Diversion Team
D2. Upgrade of 188 meters to AS4747 complaint meters by 2025/26	100% of goods installed by 30/6/2026	Count of meters installed	End of Pricing Submission	Diversion Team
D3. Installation of 195 dataloggers by 2025/26	100% of goods installed by 30/6/2026	Count of dataloggers installed	End of Pricing Submission	Diversion Team
D4. Validations of existing meter fleet	100 validations per financial year	Count of validation undertaken	Yearly	Diversion Team
D5. Installation of 20 IOT dataloggers by 2020	100% of goods installed by 31/12/2020	Count of dataloggers installed	End of 2020	Diversion Team
D6. Complete Diversion Customer Portal by end of 2021	Portal completed by Dec 2020	Portal is functioning of MW webpage	End of 2020	Diversion Team
D7. Upgrade Diversion Database to include meter and telemetry compliance codes	Compliance Codes added to Diversion Database	All Compliance Codes added to database by 31/12/2020	End of 2020	Diversion Team

Table 10: Action Plan Performance measures

14 Appendix A - Legislation, policy, inter-governmental agreements and standards for non-urban metering

Table A1: Legislation, policy, inter-governmental agreements and standards for non-urban metering

Legislation, policy, frameworks and standards	Description
The Water Act 1989 (Vic)	The Act provides the legal basis for the management of water in Victoria. **Section 142** of the Act provides, in relation to their customers' meters, for water corporations to provide, install and maintain meters on any land, to estimate the volume of water delivered if the water corporation believes a meter is functioning inaccurately, and that a meter provided or installed by the water corporation remains the property of the corporation. **Section 43 (g)** provides, in relation to a bulk entitlement, that a water corporation must install and maintain metering equipment approved by the Minister and **section 43(h)** provides that the water corporation must carry out a metering program approved by the Minister.
Statement of Obligations (General)	Part 7-4 of the Statement of Obligations (General) issued under the *Water Industry Act (1994)* requires that water corporations that provide non-urban water supplies or delivery services must prepare and implement metering action plans that comply with the Victorian Implementation Plan for the National Metering Standards for Non-Urban water metering.
NMI M 10 and NMI M 11	The National Measurement Institute (NMI) was established on 1 July 2004. The NMI is responsible for the Australian Government's measurement functions detailed in the *National Measurement Act 1960* (Cth). The NMI develops and maintains measurement standards and supporting guidelines and this includes non-urban water meter standards for pattern approval—NMI M 10[9] and NMI M 11[10].
National Water Initiative (2004)	The National Water Initiative (NWI), is the national blueprint for water reform agreed in 2004 by the Council of Australian Governments (COAG). Paragraphs 87 and 88 of the agreement specify requirements for national non-urban metering standards and a nationally-consistent framework for water metering and measurement[11] .
National Trade Measurement Regulations 2009 (Cth)	Made under the *National Measurement Act 1960* (Cth), *the National Trade Measurement Regulations 2009* (Cth) (the Regulations) support the Commonwealth system of trade measurement. Specifically, Division 11 of the regulations deals with the maximum permissible errors for water meters. The regulations effectively exempt non-urban water meters from needing to comply with the standard.

[9] NMI 2008, *Meters intended for the metering of water in full flowing pipe - Part 1: Metrological and technical requirements*, NMI M10-1, National Measurement Institute, Lindfield.

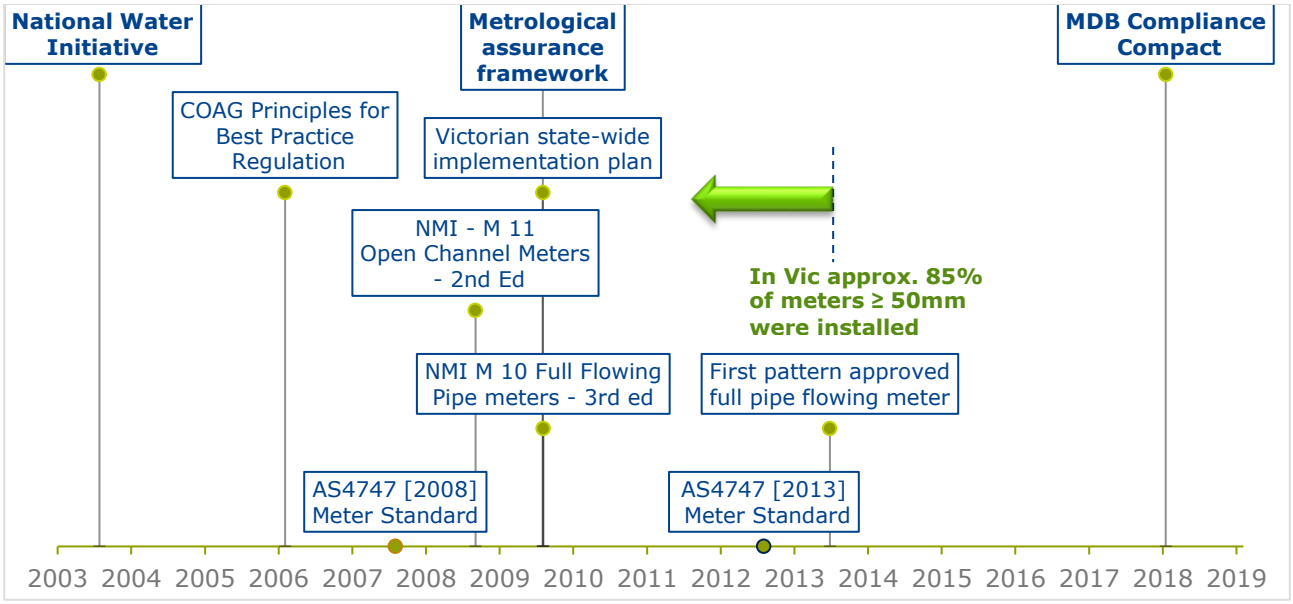
[10] NMI 2008, *Meters intended for the metering of water flowing in open channels or partially filled pipes - Part 1: Metrological and technical requirements*, NMI M 11-1, National Measurement Institute, Lindfield.

[11] Department of Agriculture and Water Resources, 2009. *National Framework for Non-urban Water Metering: Policy paper.* Department of Agriculture and Water Resources, Canberra.

Legislation, policy, frameworks and standards	Description
National Non-Urban Metering Framework (2009)	The National Non-Urban Metering Framework (the National Framework), agreed through COAG, deals with the metering commitments made under the National Water Initiative. It provides a nationally-consistent basis for water metering and outlines the implementation of national standards for meter construction, installation and maintenance, use of certified installers, maintainers and validators, and requirements for compliance, auditing and reporting. Key elements of this National Framework include the metrological assurance framework, the Australian standard for non-urban meters (AS4747) and the National Measurement Institute's standards for pattern approval.
Metrological Assurance Framework	The Metrological Assurance Framework (MAF) sets out the key requirements to make sure there is an acceptable level of confidence in meter performance.
Australian standard for non-urban meters – AS4747	AS4747 is effectively a component of the Metrological Assurance Framework. It sets the technical specifications for non-urban water meters as well as the installation, calibration and maintenance processes required to achieve pattern approval compliance.
Victorian State-wide Implementation Plan for Non-urban Water Metering (2010)	The Victorian State-wide Implementation Plan for Non-urban Water Metering (the Implementation Plan) was completed in March 2010. The Implementation Plan sets out Victoria's pathway to achieving compliance with the National Framework.
Victorian Non-Urban Water Metering Policy (2014)	The Victorian Non-Urban Water Metering Policy [12] applies to non-urban water meters of water corporations, and guides how water corporations manage these meters.
Murray-Darling Basin Compliance Compact (2018)	The Murray-Darling Basin Compliance Compact agreed on 8 June 2018, is a collaborative, joint commitment by the Australian Government and Basin states. The compact seeks to provide transparency and accountability for surface and groundwater management and regulation, and a consistent approach to compliance and enforcement practices by governments across the Basin. Section 3 of the compact deals specifically with metering and measurements and sets out an action plan to improve non-urban metering across the Basin.

[12] Department of Environment and Primary Industries (DEPI), 2014. *Victorian Non-Urban Water Metering Policy*. DEPI, Melbourne.

Figure A2. Progression of non-urban water metering



15 Appendix B: Implementation program

15.1 Table B1 Implementation program

Action	Responsible	Delivery partners	Timing
Water corporations and DELWP will review metering action plans at least once every four year economic regulation cycle.	Water corporations	DELWP	At least once per four-year economic regulation cycle
Water corporations will report annually on their meter assets	Water corporations	DELWP	Annually
DELWP will publish an annual update of Victoria's meter assets and implementation of metering on its website (Compact action 3.7)	DELWP	Water corporations	Annually
DELWP and water corporations will develop the means to report more easily and consistently on meters across the state and the amount of water measured by different categories of meters.	DELWP	Water corporations	By September 2020
Water corporations will consistently use standard terms to categorise meters and to identify the meter requirements when reporting on meters (see Tables B3, B4 and B5 below). DELWP will consult with water corporations to develop the standard specification for the fields.	Water corporations	DELWP	By September 2020
DELWP and water corporations will review meter policy and meter action plan guidelines to consider outcomes from a Commonwealth investigation into the Metrological Assurance Framework (MAF) for Non-Urban Water Meters.	DELWP	Water corporations	By end 2021
Metering coordinators from water corporations with rural customers will share information on meter and telemetry performance, implementing the policy, and improving metering practice.	Water corporations	DELWP	Ongoing
DELWP will review the Guidelines for the Development of Bulk Entitlement Metering Programs.	DELWP		To commence by June 2020
Water corporations will assess the costs and benefits of installing telemetry on meters that are still being read manually and update their metering action plans.	Water corporations		By June 2021

Water corporations refers to Goulburn-Murray Water, Lower Murray Water, Southern Rural Water, Coliban Water, Grampians Wimmera Mallee Water and Melbourne Water

15.2 Table B2 – Non-urban water meter data fields to enable consistent state-wide reporting

Item	Data	Description
1	Service Point	Service Point
2	Licence	Water Share or Licence to match Water Register
3	ABA	Allocation Bank Account
4	Manufacturer	The manufacturer name
5	Model	The model name
6	Nominal Size (mm)	DN for Fully Flowing Pipe meter or Nominal width for Open Channel meter
7	Serial number	Meter serial number on meter
8	Telemetry code	Code to indicate if the meter has telemetry and if so, broadly its type
9	Installation date	The installation date of the meter
10	VIC Compliance Code	Compliance Code of current meter
11	Meter requirement	Requirement Code for site

Notes

Fields 1,2 and 3 are to use the same format as used for the Water Register. These fields will enable a match and check for anomalies.

Fields 4 and 5 for manufacturer and model will require consistent use across the water corporations so it is possible to aggregate records. Field 6 will either require:

- *water corporation to include a new field in their meter database system for Nominal Diameter, as in most cases actual diameters are recorded; or,*
- *The DELWP meter database to have a look-up table to create a new nominal diameter field*

Field 7 – this would be optional initially to allow time for water corporations to collect this data for AS4747 meters and Interim meters

Field 8 – Telemetry Code. The proposed codes are: None (default), 4-20mA, Pulse and MODBUS.

Field 9 – Year of installation

Field 10 – Compliance Code as specified in Table B3.

Field 11 - Requirement Code as specified in

Table B4.

15.3 Table B3 - Non-urban water meter compliance codes

Compliance category	Code	Description
Compliant	AS	Pattern approved meter, installed by a certified installer, complies with the AS4747 standard and has a certificate
Contemporary (also called Interim)	CO	A meter that can operate within the maximum permissible error of +-5% under in situ conditions and provides for on-going validation. This would include pattern approved meters that fail to meet all the requirements of AS4747.
Outside contemporary standard	OT	All other measurement devices that are unable to meet validation requirements. These devices may or may not measure within the accuracy standards.
Unmetered	UM	Unmetered

15.4 Table B4 - Non-urban water meter requirement codes

Requirement	Code	Description
Accurate meter required	AM	Site is to have a maximum permissible error of +-5% under in situ conditions
Exempt - outside scope	EXOS	Exempt as water use is for D&S licence, drain diversion licence, stormwater, meters managed by other Water Corporations
Exempt - low use	EXLU	Below the threshold for high accuracy meters
Exempt - high cost	EXHC	Disproportionate cost to benefit. This may be due to extra costs required to overcome technical challenges such as iron bacteria in groundwater causing changes to flow patterns outside the meter requirements. The benefit assessment would consider the use volume together with the management objectives for the water resource area.
Exempt - supply system change planned	MO	Meter is located within an area planned for modernisation or reconfiguration and the meter upgrade, relocation or removal will be part of modernisation or reconfiguration.

15.5 Table B5 - Non-urban water meter telemetry codes adopted by Melbourne Water

Code	Description
None	No meter installed
Not required	Includes sleepers and dozer licences
4-20mA	MW does not have these types of telemetry
Pulse (Ajenti10 or Transmitter)	Existing dataloggers
Modbus (Transmitter)	Existing dataloggers
Planned - future CAPEX by 2025	Future dataloggers
DL being installed by 30/6/21	Future dataloggers

16 Appendix C: Alignment with the Murray-Darling Basin Compliance Compact

Victoria is committed to implementing the Murray-Darling Basin Compliance Compact where it is cost-effective to do so. Table C1 demonstrates how this policy is aligned with the Compact.

16.1 Table C1: Alignment with the Compact

Compact action	Requirement	Victorian response
3.2	**Meter accuracy**	
3.2 (i)	All new and replacement meters to comply with AS4747 including pattern approval and verification, by no later than June 2025	This policy requires: • new or upgraded extraction sites to be metered with an AS4747 compliant meter from the date the Policy is published; • non-compliant meters to be replaced with an AS4747-compliant meter to be replaced by June 2025; and • meters on existing extraction sites that meet an interim standard or are AS4747 compliant to be replaced at the end of their operational life with an AS4747 compliant meter. The policy does not require meters that meet an interim standard to be replaced by June 2025, if their operational life extends past June 2025, due to the high cost for little benefit as explained in page 9. Circumstances where the metering requirements can be varied to avoid costs exceeding the benefits of metering are set out in *Requirements for metering* (page 12).
3.2 (ii)	Commencing immediately, and until June 2025: a. All new and replacement meters to comply with AS4747 where available. b. Where an AS4747 compliant meter is not available the use of an interim meter that has been verified with a manufacturer's certificate of accuracy to within +/- 5% is acceptable.	
3.2 (iii)	When an existing meter no longer meets +/- 5% accuracy in the field it must be repaired and validated so that it is accurate to within +/- 5% in the field or replaced (see 3.2(i)).	
3.2 (iv)	All meters to be periodically validated consistent with the requirements of AS4747.	This policy requires meters to be validated in line with AS4747 except in circumstances where the metering requirements can be varied to avoid the costs of metering exceeding the benefits.
3.3	**Meter coverage**	
3.3 (i)	All take via water entitlements to be metered by June 2025 and a plan for achieving this.	This policy requires all extraction sites to be metered except in certain circumstances as described above by June 2025 to avoid the costs of metering exceeding the benefits.
3.4	**Transmission of Data**	
3.4 (i)	A program to progressively automate the reporting of take, regardless of how that is measured, no later than 2025	This policy (page 14) requires all metered water take to be telemetered by June 2025 except where telemetry is less suitable or practical than manual meter reading, or an alternative technology can be applied based on an assessment of the full range of costs and benefits.

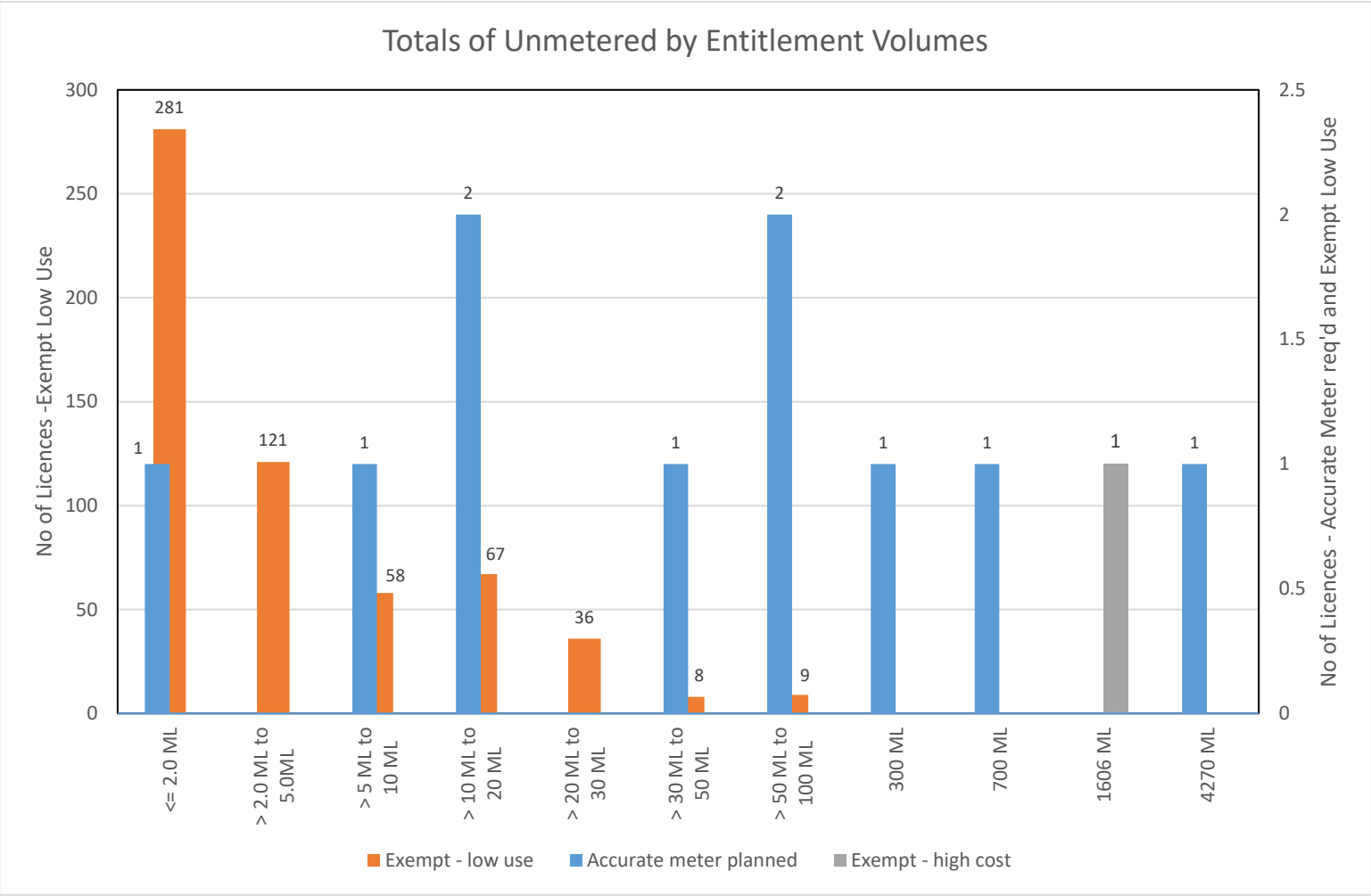
3.5	**High risk take**	
	The highest risk take, including large users in the Barwon–Darling, to be accurately metered by December 2019 and will publish what constitutes highest risk in their metering policies. High risk take should also be telemetered by December 2019 with any exemptions published.	This policy (page 14) requires water take that is more than 5,000 ML per year for an individual service point, excluding take under bulk water metering, (high risk take) to be telemetered from the date this policy is published. As described in page 10, the requirements for bulk metering are covered under a different and comprehensive metering program.
3.6	**Timetable for installation**	
	A timetable for the installation of new meters and telemetry, and auditing and maintenance of the metering fleet to meet the above requirements.	A timetable for installation of new meters and telemetry is set out in *Table 2 (*page 14*)*.

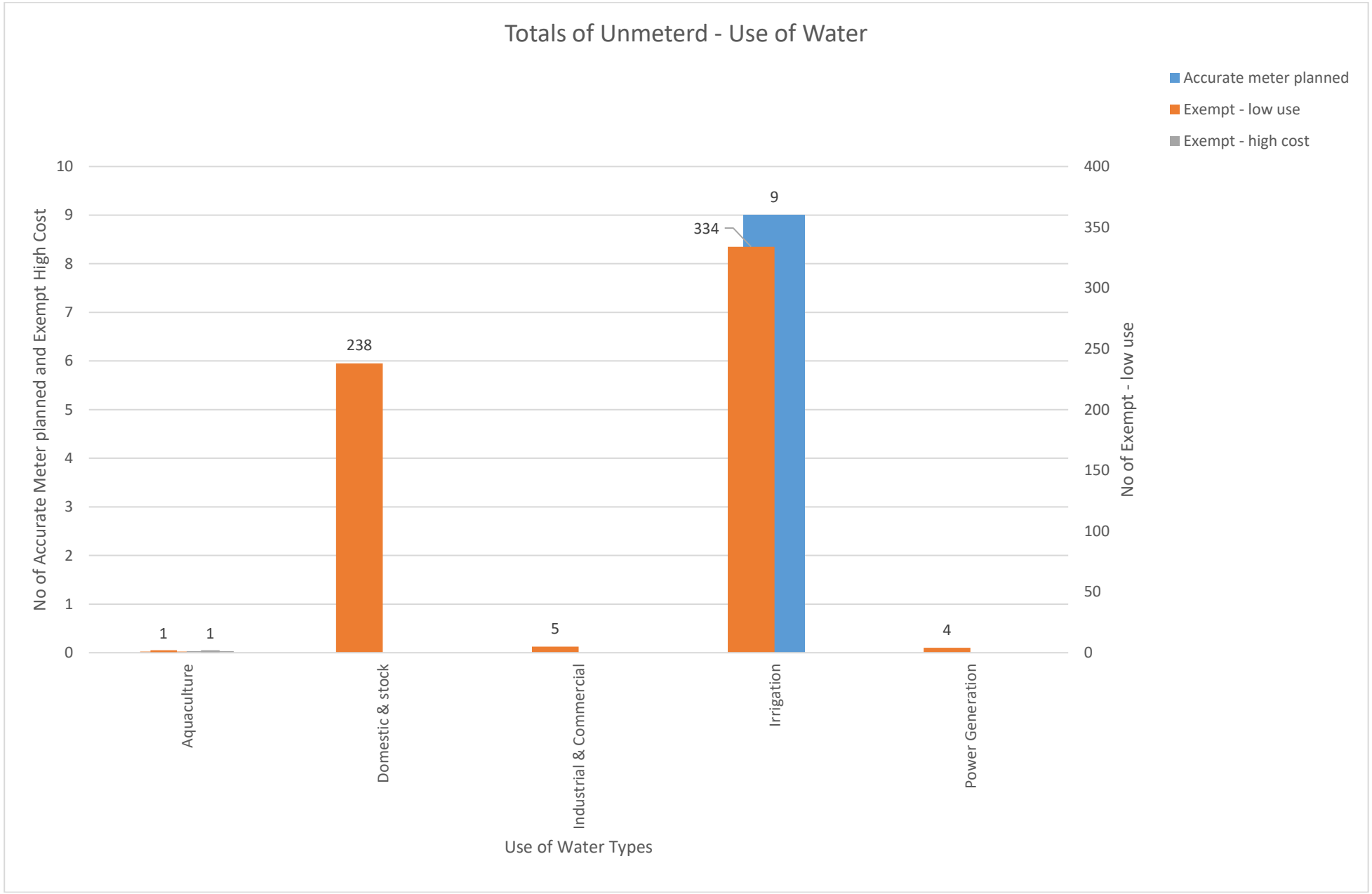
17 Appendix D – Meter Fleet for each water resource management area

	Compliant				Contemporary					Exempt					Total
Catchment Name	Existing AS4747 meters	Planned AS4747 during 20/21	Existing Compliant Meters - outside scope	**Sub Totals**	Accurate meter required	Exempt - outside scope	Exempt - low use	Exempt - high cost	**Sub Totals**	Accurate meter required	Exempt - outside scope	Exempt - low use	Exempt - high cost	**Sub Totals**	**Grand Total Meters**
Cockatoo Creek and Shepherd Creek	17	4	6	**27**	22	0	14	0	**36**	2	13	14	0	**29**	**92**
Darebin Creek	3	0	8	**11**	3	0	0	0	**3**	1	1	0	0	**2**	**16**
Diamond Creek	4	0	0	**4**	2	0	1	0	**3**	0	0	2	0	**2**	**9**
Dixons Creek	5	0	0	**5**	0	0	0	0	**0**	0	0	1	0	**1**	**6**
Don River	0	1	0	**1**	0	0	0	0	**0**	0	0	3	0	**3**	**4**
Gardiners Creek	2	3	0	**5**	0	0	0	0	**0**	1	4	1	0	**6**	**11**
Hoddles Creek	2	0	0	**2**	5	0	0	0	**5**	0	4	7	0	**11**	**18**
Kororoit Creek (Western)	2	1	10	**13**	2	0	2	0	**4**	0	2	0	0	**2**	**19**
Little Yarra River	4	1	1	**6**	12	0	1	0	**13**	3	1	3	0	**7**	**26**
Maribyrnong River	8	4	1	**13**	2	0	2	0	**4**	1	3	11	0	**15**	**32**
McCrae Creek	3	0	0	**3**	3	0	0	0	**3**	3	0	5	0	**8**	**14**
Merri Creek	3	0	0	**3**	8	0	0	0	**8**	1	0	0	0	**1**	**12**
Moonee Ponds Creek	2	1	0	**3**	0	0	0	0	**0**	0	0	0	0	**0**	**3**
Mordialloc	1	2	5	**8**	8	0	0	0	**8**	2	2	0	0	**4**	**20**
Mullum Mullum Creek	0	0	0	**0**	0	0	0	0	**0**	0	0	1	0	**1**	**1**
Olinda Creek (Lower)	1	2	0	**3**	1	0	1	0	**2**	0	0	0	0	**0**	**5**
Olinda Creek (Upper)	2	2	3	**7**	0	0	0	0	**0**	0	3	4	0	**7**	**14**
Pauls Creek	1	0	0	**1**	1	0	2	0	**3**	0	0	0	0	**0**	**4**
Plenty River	1	0	0	**1**	5	0	0	0	**5**	3	1	0	0	**4**	**10**
Steels Creek	4	0	0	**4**	1	0	0	0	**1**	0	0	0	0	**0**	**5**
Stringybark Creek (Lower)	7	7	0	**14**	5	0	4	0	**9**	2	2	1	0	**5**	**28**
Stringybark Creek (Upper)	4	5	0	**9**	2	0	1	0	**3**	0	7	1	0	**8**	**20**
Wandin Yallock Creek	26	1	1	**28**	9	0	4	0	**13**	0	12	4	0	**16**	**57**
Watsons Creek	0	0	0	**0**	0	0	0	0	**0**	0	0	0	0	**0**	**0**

	Compliant				Contemporary					Exempt					Total
Catchment Name	Existing AS4747 meters	Planned AS4747 during 20/21	Existing Compliant Meters - outside scope	**Sub Totals**	Accurate meter required	Exempt - outside scope	Exempt - low use	Exempt - high cost	**Sub Totals**	Accurate meter required	Exempt - outside scope	Exempt - low use	Exempt - high cost	**Sub Totals**	**Grand Total Meters**
Watts River	11	0	1	**12**	5	0	0	0	**5**	0	5	3	0	**8**	**25**
Woori Yallock Creek	51	5	18	**74**	27	0	12	0	**39**	15	18	46	0	**79**	**192**
Yarra River (Lower)	9	5	1	**15**	6	0	0	0	**6**	4	9	16	0	**29**	**50**
Yarra River (Upper)	16	16	3	**35**	18	0	4	0	**22**	3	23	10	0	**36**	**93**

18 Appendix E – Summary Charts of Unmetered Sites




Totals of Unmeterd - Use of Water
Accurate meter planned
Exempt - low use
Exempt - high cost
No of Accurate Meter planned and Exempt High Cost
No of Exempt - low use
10
9
8
7
6
5
4
3
2
1
0
400
350
300
250
200
150
100
50
0
1
1
238
5
334
9
4
Aquaculture
Domestic & stock
Industrial & Commercial
Irrigation
Power Generation
Use of Water Types

19 Document History

19.1 Document Control

Ownership, Review & Approval

This table identifies the people/roles responsible for definition, review and approval of the document. They are responsible for controlling changes to the document.

Document Control Responsibility	Name of Responsible Person/ Role Title	Date
Owner	Tim Donovan, Program leader Diversions	July 2020
Approver	Kirsten Shelly General Manager, Service Delivery - Waterways & Land	Aug 2020
Review Date		July 2023

19.2 Document History

Document Version number	Document Date	Document Status	Summary of Changes	Notes
1	July 2020	Draft		Draft Metering Action Plan.
2	August 2020	Final		

19.3 Disclaimer

This publication may be of assistance to you but Melbourne Water and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

All actions in this plan will be delivered subject to funding.