

Department of Planning and Environment

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Storage Curve Guideline Floodplain Harvesting Measurement

July 2022



Acknowledgement of Country

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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Storage Curve Guideline

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1 Introduction

The NSW Government is implementing a framework to licence and measure floodplain harvesting to ensure this take occurs within legal sustainable limits.

An important part of this framework is that floodplain take is measured by accurate, auditable and tamper-proof metering equipment.

The NSW Government has developed a series of implementation guidelines to assist water users and duly qualified persons (DQPs) in understanding their compliance obligations under this framework.

2 Purpose of this guideline

Floodplain harvesting measurement rules will come into effect on 1 July 2022 and roll out across the northern Basin valleys with the commencement of each valley's water sharing plan.

The purpose of this guideline is to assist landholders, surveyors and engineers to understand default storage curves and to provide practical guidance on what is needed to update storage information.

This guideline is relevant for the measurement of water take using storage metering equipment.

3 Why you need a storage curve

Water taken under a floodplain harvesting access licence must be measured either by storage or point-of intake metering equipment. The metering equipment includes a local intelligence device (LID) that transmits the water level data to WaterNSW, where this is converted to a volume using a storage curve, allowing water take to be calculated.

A key element of floodplain harvesting measurement is the use of storage curves, which defines the depth, volume and surface area relationship for each storage. Storage curves are also known as a staged-storage table or rating curve.

Storage curves are unique for each storage.

4 Storage measurement

Storage metering equipment measures the depth of water in a storage. This depth is converted to a volume using the storage curve. A storage curve is represented in tabular form (as shown in Table 1).

Table 1. Water level versus storage volume data

Water level	Surface area	Volume
mAHD	ha	ML
121.0	9.4	203
121.1	9.9	215
121.2	10.4	227
121.3	11.0	238
121.4	11.5	250
121.5	12.0	262
121.6	12.6	274
121.7	13.1	285
121.8	13.7	297
121.9	14.2	309
122.0	14.7	321
122.1	15.3	332
121.2	10.4	227
121.3	11.0	238
121.4	11.5	250
121.5	12.0	262
121.6	12.6	274
121.7	13.1	285
121.8	13.7	297
121.9	14.2	309
122.0	14.7	321
122.1	15.3	332
122.2	15.8	344
122.3	16.4	356

Water level	Surface area	Volume
122.4	16.9	367
122.5	17.4	379
122.6	18.0	391
122.7	18.5	403
122.8	19.1	414
122.9	19.6	426

5 Default storage curves

The NSW Government has developed storage curves for eligible floodplain harvesting storages using Light Detection and Ranging (LiDAR) surveys and aerial photogrammetry. This data was used to generate a three-dimensional Digital Elevation Model (DEM) of the ground surface of each storage. This data was then used to generate a storage curve for each eligible storage.

These storage curves are the default storage curves used for floodplain harvesting measurement.

For more information on how the default storage curves have been generated, please go to:

https://www.industry.nsw.gov.au/_data/assets/pdf_file/0010/271936/Storage-bathymetry-model-update-and-application-gwydir.pdf

6 Where details of storage curves are held

Storage curve data is held by WaterNSW in the DQP Portal. Default storage curves for all eligible storages have already been uploaded to the DQP Portal. **If a landholder does not update their storage curve, the default storage curves will be used for floodplain harvesting measurement calculations.**

7 Storage curve amendment

7.1 Updating storage curves

The default storage curve currently held by WaterNSW in the Data Acquisition Service (DAS), is the storage curve generated using LiDAR (light detection and ranging) or photogrammetry technology between 2014 and 2018.

We understand landholders may have submitted storage curves as part of their farm scale validation process. Because of the variability of this information, you may need to resubmit your storage curve if you believe it is more accurate than the one generated by the department.

A water user must have a DQP, on their behalf, submit an updated storage curve with supporting documentation via the DQP Portal in accordance with this guideline.

7.2 Mandatory storage curve update triggers

An amended storage curve must be submitted to the department within 21 days of the date the landholder becomes aware that the storage capacity has increased or decreased by more than 5%.

Changes to a storage capacity can be triggered by changes to embankment height or earthworks within the storage. Storage configuration including inlet pipe and overflow can also have a material effect on the accuracy of the storage curve and the floodplain harvesting measurement method.

7.3 Recalibration of metering equipment

Amendment of the storage curve data *may* require the storage meter and secondary measurement system to be recalibrated by a DQP, particularly if there are changes to the gauge zero level. A DQP will be able to advise if recalibration is required.

7.4 Qualifications and certification

To undertake a volumetric survey of a storage and generate a storage curve, all field work should be undertaken by a suitably experienced person in land surveying or civil engineering.

The **final** survey plan and storage curve data must be certified (signed off) by a DQP who is one of the following:

- A registered surveyor (under the *Surveying and Spatial Information Act 2002* or a corresponding law of another state or territory)

- A registered engineer as recognised by Engineers Australia
- Another person or class of persons approved by the Minister. You can find details on the department’s website.

7.5 Volumetric survey

A survey of the storage must be undertaken with sufficient point density to enable an accurate calculation of volume and surface area.

The survey is to be referenced to the survey benchmarks at each site. This will ensure the volumetric survey is in the correct coordinate (GDA2020) and level datum (AHD).

If a volumetric survey has been undertaken prior to the installation of the on-farm survey benchmarks, the survey must be referenced to the survey benchmarks (see *Establishing Survey Benchmarks Guideline*).

Survey codes

All surveys must report in a similar manner to ensure consistency. The following survey codes have been developed and surveyors must adopt the survey codes listed in Table 2 .

Table 2. Survey codes–

Point description	Code
Benchmark	BM1, BM2, BM3
Temporary benchmark (if needed)	TBM1
Embankment internal crest	EMB_IC
Embankment external crest	EMB_EC
Embankment internal toe	EMB_ITOE
Dam (full supply) top water level	DTOPWL
Dam lowest point (near outlet)	DLP
Existing surface	ES
Change of grade	CG
Borrow pit batter top	BPTOP
Borrow pit batter toe	BPTOE
Structure invert	IL
Dam gauge meter (optional)	DMETER

Existing surveys completed prior to the release of this guideline may use codes that differ to those described above, and these are acceptable for submission.

Survey plans

Survey plans must be produced and submitted in PDF format. To ensure consistency, all survey plans must include the following information:

Layout plan

- Storage ID
- Storage location
- Survey benchmark ID
- North point
- Survey method
- Ground survey point locations (including level annotation for key infrastructure levels i.e. pipe inverts. No annotation is required for general points)
- Contours (mAHD, 0.5m interval)
- Location of embankment longitudinal section
- Centroid of the storage (latitude and longitude)
- Temporary benchmarks (i.e. local farm marks).

Longitudinal section

- Embankment longitudinal section profile
 - Maximum 100 m intervals
 - Existing crest levels (showing deviation from average or design crest level)
 - Full supply level
 - Design freeboard.

8 Data format for submission

Data for multiple storages must not be combined into a single data file. When submitting data for multiple storages, separate files for each storage are required.

8.1 Storage curve format

To ensure consistency all storage curve data must report in a similar format. The following format has been developed (as per Table 1):

- Text-based, comma-separated values file – <filename>.CSV
- Four columns, in the order of:
 - Elevation (mAHD, 0.1m increments)
 - Area (ha, to accuracy of 0.1ha)

- Volume (ML, to accuracy of 1ML)
- Description of key elevations, i.e. embankment crest level, full supply level, etc.
- Two header rows
 - The first row identifying the column (as per above)
 - The second row identifying the unit (mAHD, Ha, ML)
- Data presented (monotonically) increasingly in mAHD.

8.2 Storage curve naming convention

It is important that storages and storage curves have consistent naming conventions to allow each to be linked. The following naming conventions must be adopted:

ROI Number_FPH Activity Number_OFS Reference.csv

For example: *M050_1_Storage1.csv*

9 Submitting information

A duly qualified person, as defined in section 7.4 must certify all survey work, calculations and final storage curves.

The following supporting information must be uploaded to the DQP Portal:

1. **PDF** of the certified Survey plans
2. **CSV data file** in the required format (refer Section 8)
3. **Certification** that all survey plans and storage curves data has been prepared or approved by a qualified person.

DQPs wishing to access the DQP Portal to upload revised storage curves need to contact WaterNSW at: dqp.enquiries@waterNSW.com.au, with 'Floodplain Harvesting' in the subject.

WaterNSW will contact DQPs to provide guidance in using the storage curve section of the DQP Portal for uploading information.

It is an offence to provide inaccurate or misleading information.