

# GDA2020/ATRF “Cheat Sheet”

In 2017, the Australian ICSM organisation released the specifications for a new, modern Australian spatial datum named “GDA2020” (Geocentric Datum of Australia 2020). This new datum was introduced in direct response to industry’s demand for improved accuracy in spatial data within Australia, for example to provide the level of spatial accuracy needed to make self-driving cars viable. Obviously, positional accuracy is also of VITAL importance to your projects!

While it will ultimately bring many benefits to our industry, GDA2020 adoption requires changes in the ways staff approach the management of spatial data and coordinate storage to ensure accuracy in our products and deliverables.

This document summarises the impacts that introduction of GDA2020 will have on projects and staff and includes recommendations on best-practice approaches to ensure compatibility with the new spatial datums.

## Software Support

Accurate use of coordinates and data stored in GDA2020 coordinate reference systems requires support in the software applications themselves. Software which has not been explicitly updated to handle GDA2020 will **NOT** handle this automatically! As of July 2020:

- QGIS: Has full support available out-of-the-box as of version 3.8.
- ArcGIS: Has partial support out-of-the-box since 10.5, but full support requires **manual post-install** steps to fully activate (specifically the installation of required “NTV2” grid files, see <http://gda2020.invisionzone.com/topic/46-gda2020-the-arcgis-platform/> and <https://support.esri.com/en/technical-article/000010151>. )
- FME: Has full support out-of-the-box since FME 2018.0
- MapInfo Professional: Has partial support since MapInfo 16, but requires manual post-install steps to activate. Accordingly it is **NOT recommended** to use MapInfo Professional with any GDA2020 datasets.
- Other non-GIS specific software which can consume spatial data (eg Alteryx, Tableau): likely no support, but please contact GIS team staff to confirm.

If the software does not include specific support for GDA2020 coordinate systems, it most likely will apply a so-called “null transform” when reading the data, and effectively interpret the data as a GDA94 reference system. This will result in data being **up to 1m offset** from its location! Accordingly, care **MUST** be taken when using software applications to ensure that only software with full GDA2020 support is used.

## Transformation Choices

When converting between the GDA94 and GDA2020 coordinate reference systems, there are **TWO** possible choices for the “transformation” to use (i.e. two different mathematical models). One model is the “conformal” transformation, the second is the “conformal + distortion” model. The correct transformation to use depends on the jurisdiction and the accuracy and lineage of the dataset being transformed, and accordingly will vary depending on the dataset!

The official recommendations released by the ICSM informing choice of transformation are shown in the table below:

Jurisdiction	NTv2 transformation grid	Comments
ACT	GDA94_GDA2020_conformal	Recommended for users transforming from GDA94 coordinates derived from CORS
ACT	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates derived from survey control marks within ACT
NSW	GDA94_GDA2020_conformal	Appropriate for users transforming GDA94 coordinates derived from unlocalised CORS or AUSPOS control.
NSW	GDA94_GDA2020_conformal_and_distortion	Appropriate for users transforming GDA94 coordinates derived from SCIMS (Survey Control Information Management System) or SCIMS-localised CORS control.
NT	GDA94_GDA2020_conformal	Appropriate for users transforming from GDA94 coordinates determined from CORS.
NT	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates determined from the survey ground control network.
Qld	GDA94_GDA2020_conformal	Recommended for transforming all GDA94 data sets in Queensland.
Qld	GDA94_GDA2020_conformal_and_distortion	Not recommended for use on Queensland data sets due to distortions at the state borders
SA	GDA94_GDA2020_conformal	Appropriate for users transforming from GDA94 coordinates determined from CORS.
SA	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates determined from the survey ground control network.
Tas	GDA94_GDA2020_conformal	Appropriate for users transforming from GDA94 coordinates determined solely from unlocalised CORS or AUSPOS observations.
Tas	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates determined from the survey ground control network and where the origin of survey control is unknown or mixed (e.g. aggregated datasets available from LISTdata.)
Vic	GDA94_GDA2020_conformal	Recommended for users transforming from GDA94 coordinates derived directly from GNSS CORS.

Vic	GDA94_GDA2020_conformal_and_distortion	n Recommended for users transforming from GDA94 coordinates derived from survey control marks within the Survey Marks Enquiry Service (SMES).
WA	GDA94_GDA2020_conformal	Appropriate for users transforming from GDA94 coordinates determined from CORS.
WA	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates determined from the local geodetic network (GOLA).
WA – Christmas and Cocos Island	GDA94_GDA2020_conformal	Recommended for Christmas and Cocos Island

In summary -- when selecting which transformation to use, you must consider the STATE and SOURCE of the original data!

### WGS84 and Web Mercator

Two of the most commonly used coordinate reference systems are the “WGS84” and “Web Mercator” coordinate reference systems. Unfortunately, both these reference systems are inherently lossy, and storing (or creating) any datasets in WGS84 or Web Mercator results in a permanent, irretrievable loss of spatial accuracy in the dataset (of the order of 10m magnitude). This is due to a limitation in these coordinate reference systems, and accordingly they should NEVER be used for storage of Australian spatial datasets.

Staff should ensure that they ALWAYS use a GDA94 or GDA2020 based coordinate reference system for spatial data and NEVER use WGS84 or Web Mercator.

Ideally, use of the correct local GDA94 or GDA2020 map grid zone (such as zone 56 for Brisbane) is preferred over the geographic (latitude/longitude based) GDA94 or GDA2020 reference systems themselves.