

Questionnaire: status 3D-Cadastres - November 2010

Australia, Queensland



This questionnaire is an activity of the FIG working group 3D-Cadastres 2010-2014. The purpose of the survey is to make a world-wide inventory of the status of 3D-Cadastres at this moment (fall 2010) and the plans/expectations for the near future (2014). By sharing this information, it should be possible to improve cooperation, learn from each other and support future developments. For more information on the FIG working group on 3D-Cadastres see the website of this working group www.gdmc.nl/3DCadastres. Now a few notes and suggestions, which should be helpful when completing the questionnaire:

- In this questionnaire the concept of 3D-Cadastres with 3D parcels is intended in the broadest possible sense. However, what exactly is (or could be) a 3D parcel is dependent on the legal and organizational context in the specific country (state, province). 3D parcels include land and water spaces, both above and below surface.
- A more formal definition: A 3D parcel is defined as the spatial unit against which (one or more) unique and homogeneous¹ rights (e.g. ownership right or land use right), responsibilities or restrictions are associated to the whole entity, as included in a Land Administration system.
- As the definition above is quite abstract, it is tried in the questions below to be more specific and real world situations are used. Also two example sets of partial/preliminary answers are included from Australia, Queensland and The Netherlands, to support the questions and to be of help when formulation the answers for your jurisdiction.
- A 3D parcel is a 'legal object' describing a part of the space. Often there is a relationship with a real world/physical object, which can also be described in 3D. Please be aware of the difference between these two types of objects and that the focus in the context of 3D-Cadastres is on 3D parcels (spaces of legal objects).
- If a certain question is not relevant or if you have no clue what to respond, do not spend any time on this (and leave the field blank).

¹ Homogenous means that the same combination of rights equally apply within the whole 3D spatial unit. Unique means that this is the largest spatial unit for which this is true. Making the unit any larger would result in the combination of rights not being homogenous. Making the unit smaller would result in at least 2 neighbour 3D parcels with the same combinations of rights.

1. General/applicable 3D real-world situations

This part of the questionnaire refers to the applicable 3D real-world situations to be registered by 3D parcels. It also addressed the types of 3D geometries, which are considered to be valid 3D representations for these parcels.

	Australia/Qld 2010	Australia/Qld 2014
1.1. Are all 3D parcels constrained to be within one surface (2D) parcel?	Yes, but this is not guaranteed for all time (i.e. the 2D parcel can be subdivided without requiring the 3D parcel to be subdivided).	By 2014 we would expect subdivision of surface parcels to violate this constraint
1.2. Are ambulatory ² boundaries permitted?	Theoretically they are, because 3D parcels are broken at surface parcel boundaries. Theoretically the limit of a unit at ground level may be bounded by a physical (ambulatory) feature.	no change
1.3. Is it allowed to have 3D parcels not related to physical constructs or objects?" (e.g. airspace, subsurface volumes)	Yes.	yes
1.4. Are disconnected parts of a single 3D parcel allowed?	Yes.	yes
1.5. Limitation – e.g. must the 3D parcel be described by a boundary definition?	Anything is permitted as a volumetric parcel, provided it can be described unambiguously and an isometric drawing supplied. Unit boundaries (building format lots) are generally described as Floors, Walls and Ceilings. Other subsidiaries such as car parks need dimensions or reference to physical objects.	no change
1.6. Are curved surfaces to bound the 3D parcels allowed?	Yes, but tools to validate them do not	yes

² An ambulatory boundary is a boundary of a land parcel which follows the movements of a natural feature such as a river. Its position determined at points of time (when a survey is carried out), but between such "fixes", the definition of the property is the position of the real world natural feature.

	exist at the moment	
1.7. Must the curved surfaces (if allowed) be cylindrical sections, or any other constraint?	No, surfaces “must be capable of precise mathematical definition” (<i>Registrar of Titles Directions for Preparation of Plans Section 10.2.2</i>)	no
1.8. Any other constraints – e.g. all surfaces must be horizontal or vertical?	No.	no
1.9. Is there generic legislation (law and/or regulations) for 3D descriptions of parcels? If so please, mention law and article(s).	Land Title Act 1994, supported by Registrar of Titles Directions for the Preparation of Plans	
1.10. Is the legal text available in original language?	yes	
1.11. Is the legal text (relevant part) available in English translation?	N/A.	
1.12. Do you have example descriptions of typical 3D parcels; either ‘prototype’ or ‘operational’?	Yes (Stoter and van Oosterom 2006), (Thompson 2007), (Lemmen, Van Oosterom et al. 2010).	more example expected
1.13. Is there a formal model for the 3D parcels (UML style); e.g. based on ISO TC211 series?	No.	probably
1.14. Are natural resources (groundwater, mining rights) considered as 3D parcels?	No.	possibly
1.15. Are polluted areas considered as 3D parcels (as legal restrictions are associated to these spaces: above and below surface)?	No.	probably not
1.16. Are spatial plans considered as 3D parcels (as rights or restrictions are related to them)? Sometimes also called spatial development plans, zoning plans or physical plans (land use, urban, regional, environmental,...)	not applicable – there is no distinction made between a 3D survey plan and a 2D plan	n/a
1.17. Any other geometric issues?	- Variable height zoning limits not defined - Local vs National height datum issues - Strata subdivision issues	

2. Infrastructure/utility networks

This refers to the situation where an infrastructure network is considered to be defined within the cadastre. For example in some jurisdictions, an underground network might be privately constructed for the purpose of leasing space in it for other organisations to run cabling. In this case, a network, or part of that network may be considered to be a real estate object.

	Australia/Qld 2010	Australia/Qld 2014
2.1. Do you register network parcels? (e.g. subterranean conduit networks)	Yes in some cases. Where a network exists on private land, and there is not a statutory right of access to place and maintain the asset, then the land is acquired or a right is acquired by way of an easement.	yes
2.2. If so, can the network structure be traced in the database(s)?	No (The networks are broken at the surface parcel, and may not be defined below roads etc.)	this may change
2.3. Does the jurisdiction have private networks? If so please, mention law and article(s).	Yes (Overhead cable networks). Privately constructed road tunnels fall into this category.	yes
2.4. If so, are they registered as 3D property parcels?	Yes in some cases.	yes
2.5. Is the legal text available in original language? If so, give references to relevant document(s).		
2.6. Is the legal text (relevant part) available in English translation?		
2.7. Do you have example descriptions of typical 3D parcels for networks; either 'prototype' or 'operational'?		yes
2.8. If the network (legal) objects break at the surface parcel, how do you deal with intersecting networks or vertically parallel networks?	The DCDB does not record network objects as a network.	this may change
2.9. Any other geometric issues?		

3. Construction/building units

This refers to 3D properties that are related to constructions and apartment (condominium) buildings. The individual units are often defined by the actual walls and structure of a building, rather than by metes and bounds. E.g. “unit 5 on level 6 of ... building”.

	Australia/Qld 2010	Australia/Qld 2014
3.1. Do you register 3D construction/building units?	Yes.	yes
3.2. If so, what are the most important types? E.g. apartment units, or also other buildings or even more general constructions (infra related; such as bridge, tunnel or even other, such as windmills,...)	Most common are building units, and may be for residential or commercial purposes.	no change
3.3. Does the jurisdiction have construction/building units? If so please, mention law and article(s).	Land Title Act 1994, Registrar of Titles Directions for the Preparation of Plans, Building Units and Group Titles Act 1980 & Regulation 2008, Body Corporate and Community Management Act 1997	
3.4. Is the legal text available in original language?		
3.5. Is the legal text (relevant part) available in English translation?	N/A.	n/a
3.6. Do you have example descriptions of typical 3D parcels; either ‘prototype’ or ‘operational’?	Yes – these are stored in the DCDB, but with no graphical extent (just the unit number and the surface area of each unit).	yes
3.7. What would be typical 3D boundaries in an apartment complex: middle of the wall and floor/ceiling, or walls, floors/ceiling as neutral/shared 3D space?	Typically the unit is defined to the middle of the walls/ceilings.	no change
3.8. Is common property inside the building registered? If so, how?	Yes. They are registered as community titles under the Community Management System (CMS) and usually is shown as Lot 0 with	no change

	Body Corporate Title	
3.9. Who owns the common property inside the building?	The body corporate. A separate Certificate of Title is issued by the titles office.	no change
3.10. Who owns the land on which the apartment is built?	The body corporate.	no change
3.11. Any other geometric issues?	- Where the main part of a lot is defined by the structure, other parts of the lot (e.g. the car park) can be defined with bearings and distances - Intersections of 2D easements and Building Format Lots may be difficult to determine.	

4. X/Y Coordinates

	Australia/Qld 2010	Australia/Qld 2014
4.1. Do the plans of survey guarantee X/Y coordinates? (and are they relative or in an absolute spatial reference system?)	No.	no change
4.2. Are the cadastral database coordinates authoritative?	No. The DCDB cadastral point positions at any time are the best estimate based on survey information and control point data. As such, point positions will change with time.	no change
4.3. If not, what is the authoritative source of X/Y coordinates?	None.	no change
4.4. Do you have parcels defined by the walls of a building (with no recorded geometry)?	Yes – “Building Unit Plans”. Units usually defined by centre of floors, walls and ceilings.	yes
4.5. What is the spatial reference system for X/Y Coordinates?		
4.6. Any other X/Y coordinate issues?	The DCDB graphical representation fits the lots together but may not represent the field surveyed measurements, these are stored in the plans itself	

5. Z Coordinates/height representation

	Australia/Qld 2010	Australia/Qld 2014
5.1. Are the z coordinates of 3D parcels relative to local ground?	Sometimes. Volumetric parcels defined against national height datum. Some old style plans give restrictions relative to ground surface. Ground level is required to be shown for all 3D volumetric parcel.	no change
5.2. Are z coordinates reduced to a standard datum (absolute)? If so, what is the spatial reference system for the Z coordinate?	Yes. Australian Height Datum	Yes. Australian Height Datum
5.3. In principle possible to store both relative and absolute z coordinate?	no	yes
5.4. Is the earth surface (height) explicitly stored (in the DCDB or other accessible register)?	No, but may be shown on volumetric plans.	probably
5.5. What is the source of elevation for the 2D surface parcel?	Surface elevations are not recorded in the DCDB.	a statewide elevation model accessible by DCDB
5.6. Any other z coordinate issues?		

6. Temporal Issues

	Australia/Qld 2010	Australia/Qld 2014
6.1. Are temporal limits part of the definition of a parcel (2D or 3D)?	No. All parcels are unlimited temporally. For example, a 1 week timeshare apartment is treated as a 1/50 share in the apartment. The registering authority does not specify which week of the year it applies to.	no
6.2. Are moving parcels allowed?	No – apart from ambulatory boundaries. These are not represented as a curve in time.	no
6.3. Are there any limitations on the range of temporal limits? (e.g. only on 3D apartments).	N/A.	
6.4. Are there any attempt to integrate 3D space and temporal representations, into a single 4D space/time representation?	no	no
6.5. In the case of tidal boundaries, what happens to the 3D ambulatory parcel if the 2D land parcel changes extent due to the movement of High Water Mark?	This is not determined yet.	determination expected
6.6. Any other temporal issues?		

7. Rights, Restrictions and Responsibilities

	Australia/Qld 2010	Australia/Qld 2014
7.1. Range of RRR on 3D parcels.	Same as 2D although may involve responsibility for common property and right to use subsidiaries such as car parks (e.g. exclusive use areas).	no change
7.2. Are there any limitations on the range of rights? (e.g. subterranean parcels must be owned by Govt).	No.	no change
7.3. Any other RRR issues?	Now possible for a Unit complex to be part of a community title. Thus owners have shared responsibilities outside the unit land parcel.	no change
7.4. Are there RRRs that are only allowed in 3D (and not valid for 2D)	No.	no
7.5. Is there specific legislation (laws, regulations) defining 3D RRR types; if so, provide details, e.g. references to documents/articles.	Queensland Government. Land Title Act 1994, reprinted as in force on 16 May 2003.	
7.6. Can 3D sub-surface/above-surface parcel be owned by someone other than the person owning the land parcel?	Yes, this happens most often in Mining areas.	no change
7.7. What applications do you foresee for 3D cadastre?	Ensuring unique definition of property rights, to serve complex property markets, 3D city models, prevention/detection of encroachments etc.	

8. DCDB (The Cadastral Database)

	Australia/Qld 2010	Australia/Qld 2014
8.1. Does the DCDB contain representation of 3D parcels (in any form)?	Yes.	no change
8.2. If so, how are they represented (in the DCDB)?	As 2D polygons in a layer above (below) the base layer.	as 3D polyhedra
8.3. If so, how are they presented on cadastral “maps” (including screen presentations)?	As polygons is a contrasting colour to the base parcels.	undecided
8.4. Are there possibilities to store geometry of 3D parcels in the DCDB?	No.	yes
8.5. Is it possible to manage a 3D topological structure in the DCDB?	No.	no
8.6. Are constraints/rules defined for valid 3D objects (closed volume, no overlap, no gap in 3D)? What about rules for a mix of 2D and 3D representations?	No constraints are enforced in the DCDB between 3D objects and other 3D or 2D objects.	yes
8.7. How can internal and external user query and visualize the 3D content supporting rotating, slicing, transparency, perspective (3D web/view service, 3D pdf documents,...)?	Need to go to Survey Plans for details.	undecided
8.8. What Spatial DBMS software do you use? Any 3D capabilities included and used?	Ingres. No 3D capabilities at the moment.	undecided
8.9. Do you have any validation rules for 3D representation in the database?	These are still being specified.	undecided
8.10. What (GIS/CAD) software is used for updating, editing, analysis, and visualization of the cadastral data? Any 3D capabilities included and used?	Microstation, 3D capabilities not used at present	
8.11. What web software is used for remote data access/distribution and visualization? Any 3D capabilities included and used?	none	
8.12. Is your DCDB organised as Multi-Layers or Object Oriented or some other data model?	Object-oriented (but with layer as an attribute).	object oriented
8.13. How do you query 3D	As all other objects,	as other objects

objects in your DCDB?	(but with only the 2D footprint returned).	
8.14. Is it possible to query neighbourhood parcels to a 3D object, vertically as well as horizontally?	Not possible to query parcel information vertically above or below.	yes
8.15. Any other DCDB issues?		

9. Plans of Survey (including field sketches)

	Australia/Qld 2010	Australia/Qld 2014
9.1. Do the survey plans carry 3D parcel representations?	Yes.	yes
9.2. If so, how are they represented?	As a tabulation of corner positions, associated with plan, and isometric views (on paper). Each floor is represented on a separate diagram. Heights (AHD) are given for corners of non horizontal surfaces.	no change
9.3. Is there specific legislation (regulations) describing the requirements for Plans of Survey in 3D? If so, please give link to the relevant documents.	Yes. Queensland Government. Registrar of Titles directions for the preparation of plans. Queensland, Australia, 2003.	yes
9.4. Is sketch level allowed (low geometric quality, but in principle enough to indicate the 3D object)?	Yes.	yes
9.5. Is it possible to define a 3D parcel by referring to other 3D real world objects/ topography (and not specifying coordinates)?	Historically, “to the depth or below the depth”	no change
9.6. In what format are the 3D parcels submitted for registration; attached to legal document in a single pdf (which has good 3D capabilities) or in an extension of (city)GML for 3D parcels, or....?	At present, on paper, but will be submillted in “LandXML”.	LandXML
9.7. Are the 3D parcels somehow checked for spatial validity; e.g. volume is closed, does not overlap with neighbour volume (and also no unwanted 3D gaps)?	Visually at present.	by reference to validation rules
9.8. Do you have examples of (prototype or production) 3D survey plans available?	Yes – figures 15 and 16 (Lemmen, Van Oosterom et al. 2010).	yes
9.9. Are any reference objects visible on the survey plan (e.g. real buildings, roads, that is 3D	Sometime occupation is recorded. Occupation refers to physical	no

topography)?	structural parts.	
9.10. What form of 3D data acquisition is used (CAD designs, terrestrial surveying, sketches, stereo and/or oblique images, laser scanning,...)?	Terrestrial surveying	Also location refinement using Lidar
9.11. What software do you use for creating and processing survey plans? Any 3D capabilities included and used?	SIP (Survey Information Processing) Capture Tool and Microstation.	
9.12. Can 3D parcels be subdivided, consolidated or nullified?	Yes,	
9.13. Is there any existing technical circular or directive to assist Surveyors in 3D data collection in the field?	Not exclusively. However, various documents exist on Preparation of Plans etc to assist Surveyors.	
9.14. Any other survey plan issues?		

10. Other Issues

Please include any other issues that may be of interest in an international context. For example, in some foreign jurisdictions 3D parcels can only be separated by horizontal planes.

10.1. Country (State, Province)	Australia/Queensland
10.2. Your name, function/position and your organization	Dr Rod Thompson Principal Computer Systems Officer, Spatial Policy Department of Environment and Resource Management
10.3. Contact details: address email, telephone	Tel: 07 38963286 Rod.Thompson@qld.gov.au Level 9 Landcentre Cnr Main & Vulture Streets Woolloongabba GPO Box 2454 Brisbane QLD 4001
10.4. Other issues	

- Lemmen, C., P. Van Oosterom, et al. (2010). The Modelling of Spatial Units (Parcels) in the Land Administration Domain Model (LADM). FIG Congress 2010, Sydney, Australia.
- Stoter, J. and P. van Oosterom (2006). 3D Cadastre in an International Context. Boca Raton FL, Taylor & Francis.
- Thompson, R. J. (2007). Towards a Rigorous Logic for Spatial Data Representation. PhD thesis, Delft University of Technology, Delft, The Netherlands, Netherlands Geodetic Commission.