Australian Government
Geoscience Australia

NATIONAL EXPOSURE INFORMATION SYSTEM (NEXIS)
BUILDING EXPOSURE
STATISTICAL AREAS LEVEL 1 (SA1) AGGREGATED
METADATA

Keywords:
NEXIS, SA1, residential, buildings, dwellings, population, commercial, industrial

Abstract:
In order to understand the effect a natural or man-made disaster could have on a community we need to know as much as we can about the people, buildings and activities occupying that area. This includes information about:

- the number of people who may be affected, where they live and their social vulnerabilities to understand their capability to prepare or recover from an event;
- the different types of construction materials and structural characteristics for residential, commercial and industrial buildings to calculate the damage and cost to rebuild; and
- the type of residential, commercial and industrial activity occurring in each building to understand the loss of economic activity and affect to the community.

Exposure information is used to not only investigate physical impacts of a disaster, but also forms base information needed to assess socio-economic impacts such as financial loss in a farming community from severe cyclonic wind storms.

The National Exposure Information System (NEXIS) is a unique modelling capability designed by Geoscience Australia (GA) to provide comprehensive and nationally consistent exposure information enabling users to better understand the potential elements at risk in Australia. GA embarked on the development of NEXIS in response to the Council of Australian Governments (COAG) reform commitment on Australia's ability to manage natural disasters and other emergencies. The COAG commitment was for the establishment of a 'nationally consistent system of data collection, research and analysis to ensure a sound knowledge base on natural disasters and disaster mitigation' (DOTARS 2002).

NEXIS is designed to utilise publicly available information, statistics, spatial and survey data to model exposure information about residential, commercial and industrial buildings, institutions (public), infrastructure assets and agricultural commodities. NEXIS complies and provides up-to-date exposure information aggregated at ABS SA1 for all residential, commercial and industrial buildings in Australia.

This information is used to calculate the risk from natural and man-made disasters in order to inform policy and operational decision makers of the impact on Australian communities. It also serves as an important component for improving several internal GA projects undertaken by the Community Safety Group which investigate natural and man-made risks and their impacts on the community.

Summary of Product Changes for NEXIS Version 9

Data model/methodology changes:

- Improved automated processing of cadastre to create parent/child relationships
- A new social vulnerability indicator – persons aged 14 years and under

Source data updates/changes:

- Updated GNAF – August2017
- Updated CadLite – August 2017
- Updated Postcode boundaries – August 2017
- Updated Office of the Valuer-General data - SA
- Updated Office of the Valuer-General data - Tas
- Updated Building Price index – March 2017
- Addition of building locations from LPMA data for NSW
- New 2016 ASGS geographies
- New Household Contents ABS 2015/16
- New ABS 2016 population and housing Census information

- with the exception of top 5 employing Industries (expected release mid-late November)
- and SIFA (expected release early 2018).

NOTE: Related web services for NEXIS Version 9 will be available in early 2018.

This product is a Statistical Areas Level 1 (SA1) aggregated version of NEXIS building exposure Version 9 2017.

Lineage Statement:

The NEXIS building exposure information is aggregated to the Australian Bureau of Statistics (ABS) – Australian Statistical Geography Standard (ASGS) Statistical Areas Level 1 (SA1) 2016 as defined and maintained by the ABS.

Disclaimer:
Geoscience Australia has tried to make the information in this product as accurate as possible. However, it does not guarantee the information is totally accurate or complete. Therefore, you should not solely rely on this information when making a commercial decision. This dataset is not to be used for operational purposes.

Source Information:
NEXIS has been produced using the following datasets:

- The Geocoded National Address File (G-NAF®) for spatial locations of known addresses supplied by NAVIGATE, a reseller of PSMA Australia Limited data
- The Property Cadastre, CADLITE®, for cadastral parcel size and location supplied by PSMA Australia Limited
- ACT Cadastre parcel information and Building Footprints, ACT Planning and Land Authority (ACTPLA)
- SA Cadastre parcel information, Department of Transport Energy and Infrastructure (DTEI) SA
- NSW Cadastre parcel information and building locations Land and Property Management Authority (LPMA)
- QLD Cadastre parcel information, Department of Environment and Resource Management (DERM)
- NT Building Footprints, Department of Lands, Planning and the Environment. (DLPE)
- WA Building Footprints and Land Property, Western Australian Land Information Authority Landgate
- Launceston, Glenorchy and Hobart Building footprints, Tasmanian Local Government Area
- Ballarat and Geelong Building footprints, Victorian Local Government Area
- Geoscience Australia's National Mapping 1:25,000 scale homestead data
- The 2016 Australian Bureau of Statistics (ABS) Australian Statistical Geography Standard (ASGS) administrative boundaries and Census of Population and Housing Survey data.
- ABS 2015-16 Survey of Income and Housing (SIH)
- Altus Group Cost Management Pty Ltd, 2010. Costing Modules for Residential Buildings.
- Turner & Townsend Pty Ltd, 2010. CBD and Industrial Building Costing Modules.
- Rawlinsons Australian Construction Handbook, 32 edition, edited by Rawlinsons Quantity Surveyors and Construction Cost Consultants, Rawlhouse Publishing, Perth, W.A. inc Building Price Index Quarterly updates
- The Census of Land Use and Employment (CLUE), City of Melbourne
- The Tasmanian Department of Primary Industries and Water, Office of the Valuer General.
- The South Australian Department for Transport, Energy and Infrastructure, Office of the Valuer General.
- Geoscience Australian Building surveys: Adelaide, Brisbane, Melbourne and Sydney CBD Building Surveys; Newcastle, Wagga Wagga, Wetherill Park Building Survey; Urban Stormwater Climate Change impact Study: Alexandra Canal; Kalgoorlie Earthquake Building Survey

Positional (Spatial Confidence) Accuracy:
The spatial confidence has not been captured as an attribute of the data. The underlying spatial accuracy of the individual buildings as an input into the SA1 aggregation is based on the source data. Building locations are acquired from the GA 25k rural homestead data, building footprint data supplied by ACT, NT and WA State, and VIC and TAS Local Government agencies, and PSMA G-NAF.

Attribute Accuracy and Completeness:
Attribute data, if available and appropriate, is used from the source data listed above. Where attribute data is not available at the individual building, NEXIS draws on known building characteristics and creates statistics to apply to unknown buildings in similar homogenous areas of Australia.

Logical Consistency:
The NEXIS application is developed using python accessing ESRI geo-processing tools and has inbuilt tests to ensure input data, rules and assumptions are implemented consistently.

Data structure has been tested and confirmed to conform to the schema:
- Attribute names

- Attribute types
- Attribute lengths
- Attribute precision
- Attribute scale
- Compulsory attributes populated

Completeness:
NEXIS aims to capture all Residential, Commercial or Industrial buildings across Australia. Due to the nature of the available data, NEXIS often identifies proposed or partially constructed buildings if the address and/or cadastre parcel has already been created.

Attributes Captured:
Residential

Note:
NEXIS information is not intended for operational purposes at the building or individual feature level but provides aggregated exposure information at existing administrative or geographic boundaries. However, SA1's with a dwelling count of less than 20 will have all the demographic information removed due to potential privacy concerns as well as the data losing meaning at small aggregations.

- State: State (and Territory) are spatial units separately representing the geographic extent of Australia, and the States and Territories within Australia.
- SA1 Code: ABS ASGS 2016 Statistical Areas Level 1 Code
- Population estimate: The population estimate methodology takes into account the average population per occupied private dwelling structure type for each SA1, the proportion of unoccupied dwellings in the total dwelling stock by structure type, the ratio between the 2016 Estimated Resident Population (ERP) and the Census population counts and the number of NEXIS derived residential dwellings. ABS Census 2016.
- Number of residential dwellings: A permanent and private dwelling structure intended to house people within it i.e. house and flat.
- Number of residential buildings: A building consisting of one or more dwelling units with the primary use to house people.
- Number of separate houses (SH): A residential house which is separated from other residential dwellings and does not share a common wall
- Number of semi-detached houses (SD): A residential dwellings sharing a common wall with another dwelling, having their own private grounds with no other dwellings above or below
- Number of flat or apartment buildings with up to 2 storeys (F0): A residential apartment building up to two (2) storeys
- Number of flat or apartment buildings with 3 storeys (F3): A residential apartment building with three (3) storeys
- Number of flat or apartment buildings with 4 or more storeys (F4): A residential apartment building with four (4) or more storeys
- Number of residential buildings built pre and including 1980, post 1981 or unknown: The division of buildings into pre 1980 and post 1981 signifies change to important building standards in Australia. Other age classifications are available on request
- Number of residential buildings with each wall type: Hebel (AAC), cavity and solid masonry, fibre cement, metal sheeting, mudbrick or rammed earth, precast concrete, concrete masonry, synthetic, timber, and veneer masonry
- Number of residential buildings each roof type: concrete, fibre cement, imitation tile, metal sheeting, synthetic and tile
- Residential Building Footprint: Sum of all residential building footprints (m2)
- Residential Structure Value: The cost to rebuild the existing structure (size and construction materials) at current building standards at the current costs for all residential buildings (rounded to the nearest million AUD). Source: Altus Group Cost Management Pty Ltd (2010; updated – **March 2017**)
- Residential Contents Value: Residential contents value is calculated by applying the average value(s) of household contents, by dwelling structure, for capital city and rest of state, from the ABS Survey of Income and Housing (SIH). (rounded to the nearest million $AUD).
- Floor area for each dwelling type: Sum of the building area (footprint x no. of storeys) for separate and semi-detached houses, and flats or apartments with 2, 3 or 4+ storeys
- Percentage of residential dwellings with low ($1-$499), middle ($500-$1499) or high (greater than $1500) gross household income: For each dwelling type (SH, SD, F0, F3 and F4), a percentage calculates the Nil, Low, Medium or High gross household weekly income as a proportion of all dwellings of that type. Dwellings with a negative gross household income are included in the Nil category.
- Percentage of residential dwellings with nil, low, middle or high equivalised income: For each dwelling type (SH, SD, F0, F3 and F4), a percentage calculates the Nil, Low, Medium, or High equivalised total household income as a proportion of all dwellings of that type. Dwellings with a negative equivalised total household income are included in the Nil category. ABS Census 2016.
    - Equivalised total household income is total income adjusted by the application of an equivalence scale to facilitate comparison of income levels between households of differing size and

composition. An 'ABS-modified OECD equivalence scale' is used where 1 point is allocated to the first adult, 0.5 points to every subsequent adult and 0.3 for every child under 15.
    - Equivalised total household income can be viewed as an indicator of the economic resources available to a standardised household. For a lone person household it is equal to household income. For a household comprising more than one person, it is an indicator of the household income that would be needed by a lone person household to enjoy the same level of economic wellbeing
- Percentage of residential dwellings owned, rented privately, rented publicly or other tenure: For each dwelling type (SH, SD, F0, F3 and F4), a percentage calculates the tenure:
    - Owned – Owned outright or owned with a mortgage
    - Rented – Rented from a real estate agent or direct from owner
    - Rented Public Housing – Rented from a State/Territory housing authority or rented from a co-operative, community or church group
    - Other Tenure Types – Rented from a person not in the same household, occupied rent-free, occupied under a life tenure system and all other tenure types, as a proportion of all dwellings of that type. ABS Census 2016
- Percentage of residential dwellings where one or more persons are Indigenous: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone person or group household with one or more Aboriginal, Torres Strait Islanders or Indigenous persons as a proportion of all dwellings of that type. ABS Census 2016.
- Percentage of residential dwellings with one or more persons in the household aged between 0 and 4 years: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone person or group household where one or more persons are aged between 0 and 4 years as a proportion of all dwellings of that type. ABS Census 2016
- Percentage of residential dwellings with a person aged 14 years and under. For each dwelling type, a value for the 'persons aged 14 years and under' indicator is calculated from the proportion of all dwellings within each SA1.
- Percentage of residential dwellings with ALL persons aged 65 years and over: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone person or group household where ALL persons are aged 65 years and over as a proportion of all dwellings of that type. ABS Census 2016.
- Percentage of residential dwellings with one-parent families: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates one-family households containing a one-parent family with children under the age of 15 as a proportion of all dwellings of that type. ABS Census 2016.
- Percentage of residential dwellings with one or more persons needing assistance with core activities: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone person or group household where one or more persons needs assistance with a core activity as a proportion of all dwellings of that type. This indicator considers persons needing help or assistance in one or more of the three core activity areas of self-care, mobility and communication due to profound or severe disability, long term health condition (lasting six months or more) or old age. ABS Census 2016.
- Percentage of residential dwellings where one or more persons do not speak English well or at all: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone person or group household where one or more persons do not speak English well or at all as a proportion of all dwellings of that type. ABS Census 2016.
- Percentage of residential dwellings where ALL persons do not speak English well or at all: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone person or group household where all persons do not speak English well or at all as a proportion of all dwellings of that type. ABS Census 2016.
- Percentage of residential dwellings where ALL persons highest educational attainment was year 11 or below: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone person or group household where all persons highest educational attainment is year 11 or below as a proportion of all dwellings of that type. This also includes households where all persons have no educational attainment. ABS Census 2016.
- Percentage of residential dwellings where one or more persons undertook voluntary work: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone person or group household where one or more persons undertook voluntary work as a proportion of all dwellings of that type. This indicator comprises people who spent time doing unpaid voluntary work through an organisation or group, in the twelve months prior to Census night. It excludes work done as part of paid employment if the main reason is to qualify for a Government benefit or if the work was done as part of a family business. ABS Census 2016.
- Percentage of residential dwellings that DO NOT have access to a motor vehicle: For each dwelling type (SH, SD, F0, F3 and F4), a percentage calculates dwellings that do not have access to a registered motor vehicle at or near the dwelling (on Census night) as a proportion of all dwellings of that type. ABS Census 2016.
- Percentage of residential dwellings where all persons in the household moved residential address from 2015 to 2016: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone person or group household where all persons in the household previously lived in a different SA1 in 2015 to the SA1 they lived in on Census night as a proportion of all dwellings of that type. ABS census 2016.
- Percentage of residential dwellings where all persons in the household moved residential address from 2011 to 2016: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone

person or group household where all persons in the household lived in a different SA1 in 2011 to the SA1 they lived in on Census night as a proportion of all dwellings of that type. ABS census 2016.

- Percentage of residential dwellings where ALL persons are unemployed: For each dwelling type (SH, SD, F0, F3 and F4) a percentage calculates a family, lone person or group household where all persons are unemployed as a proportion of all dwellings of that type. ABS Census 2016.
- Top 5 Employing Industries: For each dwelling, a percentage calculates the top 5 employing industry. ABS Census 2016
    - Accommodation and Food Services;
    - Administrative and Support Services;
    - Agriculture, Forestry and Fishing;
    - Arts and Recreation Services;
    - Construction;
    - Education and Training;
    - Electricity, Gas, Water and Waste Services;
    - Financial and Insurance Services;
    - Health Care and Social Assistance;
    - Information Media and Telecommunications;
    - Manufacturing;
    - Mining;
    - Other Services;
    - Professional, Scientific and Technical Services;
    - Public Administration and Safety;
    - Retail Trade;
    - Transport, Postal and Warehousing;
    - Rental, Hiring and Real Estate Services;
    - Wholesale Trade;

Commercial

- State: State (and Territory) are spatial units separately representing the geographic extent of Australia, and the States and Territories within Australia.
- SA1 Code: ABS ASGS 2016 Statistical Areas Level 1 Code
- Number of Commercial Buildings: A building consisting of one or more commercial trade and primarily occupied with or engaged in commercial trade or work intended for commercial trade, including wholesale and retail trades, office and transport activities
- Number of Buildings built pre and including 1980, post 1981 or unknown: The division of buildings into pre 1980 and post 1981 signifies change to important building standards in Australia. Other age classifications are available on request
- Number of buildings for each commercial construction type: See Table 1 for details of NEXIS commercial construction types
- Commercial Building Footprint: Sum of all commercial building footprints (m2)
- Commercial Structural Value: The cost to rebuild the existing structure (size and construction materials) at current building standards at the current costs for all commercial buildings (rounded to the nearest million AUD). Source: Turner & Townsend Pty Ltd (2010; updated **March 2017**)
- Floor area for each commercial construction type: Sum of the building area (footprint x no. of storeys) for each NEXIS commercial construction type

Table 1: Commercial

Number of Storeys	Construction Type	Description
1 – 3 Storeys	C_O_13	Concrete Frame and/or Shear wall; Other Exterior Walls
	C_URM_13	Concrete Frame and/or Shear wall; URM Exterior Walls
	LBM_C_13	Load Bearing Masonry; Concrete Column Floors
	LBM_S_13	Load Bearing Masonry; Steal Beams and Columns
	LBM_T_13	Load Bearing Masonry; Timber Column Floors
	S_O_13	Steel Frame with/without Concrete Shear Core; Other Exterior Walls
	S_URM_13	Steel Frame with/without Concrete Shear Core; URM Exterior Walls
4 – 7 Storeys	C_O_47	Concrete Frame and/or Shear wall; Other Exterior Walls
	C_URM_47	Concrete Frame and/or Shear wall; URM Exterior Walls
	LBM_C_47	Load Bearing Masonry; Concrete Column Floors
	LBM_S_47	Load Bearing Masonry; Steal Beams and Columns
	LBM_T_47	Load Bearing Masonry; Timer Column Floors
	S_O_47	Steel Frame with/without Concrete Shear Core; Other Exterior Walls

	S_URM_47	Steel Frame with/without Concrete Shear Core; URM Exterior Walls
8 – 35 Storeys	C_835	Concrete Frame and/or Shear wall
	S_835	Steel Frame with/without Concrete Shear Core
36+ Storeys	C_36	Concrete Frame and/or Shear wall
	S_36	Steel Frame with/without Concrete Shear Core

Industrial

- State: State (and Territory) are spatial units separately representing the geographic extent of Australia, and the States and Territories within Australia.
- SA1 Code: ABS ASGS 2016 Statistical Areas Level 1 Code
- Number of Industrial Buildings: A building consisting of one or more industrial trade and primarily occupied for warehousing and the production and assembly activities of industrial establishments, including factories and plants.
- Number of Buildings built pre and including 1980, post 1981 or unknown: The division of buildings into pre 1980 and post 1981 signifies change to important building standards in Australia. Other age classifications are available on request
- Number of Buildings for each industrial construction type: See Table 2 for details of NEXIS industrial construction types
- Industrial Building Footprint: Sum of all industrial building footprints (m2)
- Industrial Structural Value: The cost to rebuild the existing structure (size and construction materials) at current building standards at the current costs for all industrial buildings (rounded to the nearest million AUD). Source: Turner & Townsend Pty Ltd (2010; updated **March 2017**)
- Floor area for each industrial construction type: Sum of the building area (footprint x no. of storeys) for each NEXIS industrial construction type

Table 2: Industrial

Number of Storeys	Construction Type	Description
Single Storey	ISS_URM_S	URM Walls; Supporting Steel Roof
	ISS_URM_PS	URM; Steel Portal Frame and Roof
	ISS_RM_S	RM; Supporting Steel Roof
	ISS_SS_S	Steel Frame; Steel Clad Walls and Roof
	ISS_SSURM_S	Steel Frame; URM/Steel Clad Walls; Steel Roof
	ISS_SSPC_S	Steel Frame; Precast/Steel Clad Walls; Steel Roof
	ISS_SPC_S	Small Panel; Precast Walls; Steel Portal Frame and Roof
	ISS_PC_S	Large Panel; Precast Walls; Supporting Steel Roof
Double Storey	IDS_CSURM_S	Concrete First Floor; Steel Portal Above; URM walls; Steel Roof
	IDS_CSPC_S	Concrete First Floor; Steel Portal Above; Precast Walls; Steel Roof
	IDS_CURM_S	Concrete First Floor; URM Walls; Steel Roof
Single Storey with Basement Car Park Structure	ISSB_CSPC_S	Concrete Basement; Steel Portal Superstructure; Precast Walls
	ISSB_SSS_S	Steel Frame; Concrete Pan Basement; Steel Superstructure

Last Revision:
NEXIS Version 7, July 2016

Related Datasets:
NEXIS Building Exposure Version 9, November 2017

Data Maintenance:
The dataset will be maintained as required or by formal agreement with Geoscience Australia.

Release Regime:
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