Appendix G - BUILDING INVENTORY

Building inventory for the Newcastle and Lake Macquarie regions was not readily available for the risk assessment process. Hence, a field survey was conducted by the Cities Project to determine a sample representation of the building stock. The building survey involved a three week effort by an approximate full-time equivalent of 5 people. The survey was conducted on foot, bike and in cars by collecting data on palmtop computers, with spatial location recorded with a Differential GPS unit (Stehle and Pownall, 2001).

Approximately a 1 in 10 nominal survey rate was employed for inner Newcastle. This rate was 1 in 20 for outer Newcastle and even coarser for Lake Macquarie (see Figure G - 1). The 1 in 10 survey rate was implemented by surveying buildings with addresses ending with the numeral “5”. The 1 in 20 survey rate was similarly implemented by surveying buildings ending with “05”, “25”, “45”, “65” and “85”. The survey rates, number of buildings surveyed and total building numbers for each suburb are listed in Table G - 1. Overall, approximately 6300 sites were surveyed.

The sampling regime was roughly checked by comparing the statistically inferred number of buildings per suburb, as determined from the survey, to statistics generated from 1996 census data and cadastral lot information. Neither source is expected to be totally accurate sine 1996 data only roughly reflects the present built environment, and the cadastral lots are not necessarily built upon. The building numbers, as shown in Table G - 2, for each suburb, indicate a reasonable level of agreement.

For all the suburbs inside the study region a multiplying factor was derived from dividing the total number of buildings surveyed in the field for each suburb by the total number of existing buildings for each suburb. In hindsight, all commercial, industrial, and special buildings such as fire stations, police stations should have been ignored to give a more accurate multiplying factor as the real total building count is for residential dwelling only. Such an adjustment is only a minor one however it does fine tune the risk assessment process.

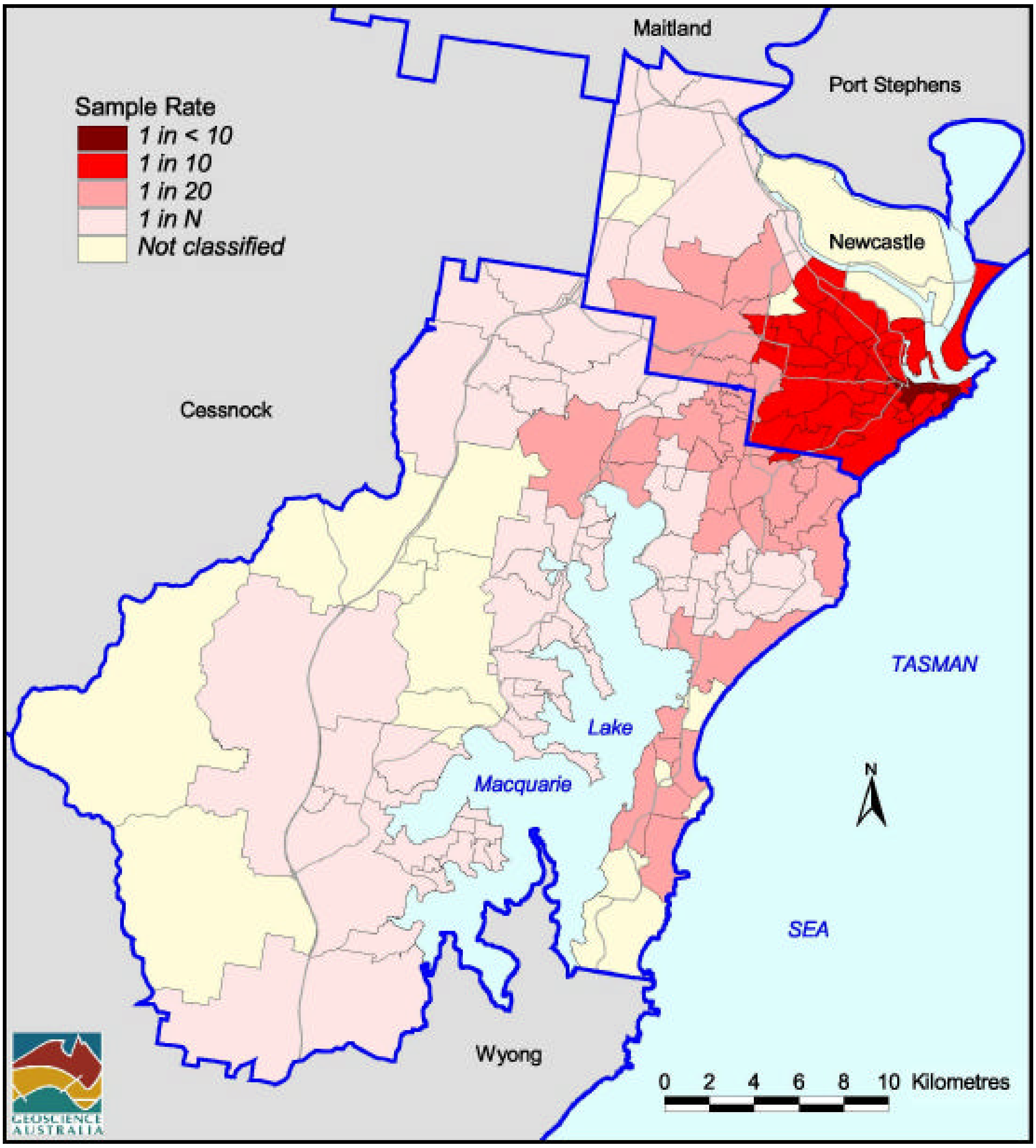


Figure G - 1: Survey rates across the study region

Table G - 1 : Survey rates and building counts by suburb

SUBURB	No. of surveyed sites	Survey rate / Multiple	Total Building Count	Cadastre Count
ADAMSTOWN	210	9.6	2015	2004
ADAMSTOWN HEIGHTS	194	10.4	2011	1989
ARCADIA VALE	3	220	660	676
ARGENTON	3	188.3	565	584
BALCOLYN	3	130	390	391
BALMORAL	3	89	267	286
BAR BEACH	30	10.1	302	296
BARNSLEY	3	339.3	1018	1077
BELMONT	8	275.6	2205	2212
BELMONT NORTH	21	96.4	2025	2035
BELMONT SOUTH	5	83.2	416	430
BENNETTS GREEN	3	1	3	41
BERESFIELD	7	187	1309	1364
BIRMINGHAM GARDENS	43	18.5	796	797
BLACK HILL	3	16.7	50	14
BLACKALLS PARK	3	351	1053	1130
BLACKSMITHS	42	17.7	744	768
BOLTON POINT	3	244.7	734	716
BONNELLS BAY	5	300.6	1503	1609
BOOLAROO	28	22.9	640	652
BOORAGUL	4	127.5	510	504
BRIGHTWATERS	3	128.3	385	367
BROADMEADOW	80	8.8	705	967
BUTTABA	3	112.7	338	515
CARDIFF	70	37.2	2602	2533
CARDIFF HEIGHTS	37	11.8	438	429
CARDIFF SOUTH	57	17.9	1021	1103
CAREY BAY	3	91.7	275	273
CARRINGTON	66	13.3	880	655
CAVES BEACH	60	25.8	1550	1564
CHARLESTOWN	259	17.9	4642	4508
COAL POINT	3	234	702	610

SUBURB	No. of surveyed sites	Survey rate / Multiple	Total Building Count	Cadastre Count
COOKS HILL	110	8.4	920	659
COORANBONG	4	127.5	510	951
CROUDACE BAY	3	60.7	182	183
DORA CREEK	4	197.3	789	782
DUDLEY	50	19.2	961	950
EDGEWORTH	7	417.6	2923	2914
ELEEBANA	5	397	1985	1899
ELERMORE VALE	70	20.9	1460	1428
ERARING	3	6.7	20	1
ESTELVILLE	3	52.3	157	349
FASSIFERN	3	65	195	208
FENNELL BAY	3	205.3	616	594
FISHING POINT	3	161.7	485	492
FLETCHER	3	34.3	103	391
FLORAVILLE	3	129	387	387
GARDEN SUBURB	37	13	481	551
GATESHEAD	86	14.5	1250	1255
GEORGETOWN	85	9.6	820	828
GLENDALE	3	367.7	1103	1125
HAMILTON	172	10.4	1790	1200
HAMILTON EAST	46	9	412	403
HAMILTON NORTH	56	7.4	416	394
HAMILTON SOUTH	151	6.7	1006	1074
HEXHAM	3	26.3	79	175
HIGHFIELDS	15	22.4	336	338
HILLSBOROUGH	14	17.3	242	244
HOLMESVILLE	5	104	520	425
ISLINGTON	108	8.3	898	800
JESMOND	72	9.6	694	672
JEWELLS	3	281.7	845	833
KAHIBAH	47	17.6	826	800
KILABEN BAY	3	138.3	415	385
KILLINGWORTH	3	73.7	221	475

SUBURB	No. of surveyed sites	Survey rate / Multiple	Total Building Count	Cadastre Count
KOTARA	172	9.1	1563	1554
KOTARA SOUTH	20	22.5	450	473
LAKELANDS	3	159.3	478	477
LAMBTON	205	9.7	1998	2029
MACQUARIE HILLS	5	162.4	812	833
MARKS POINT	30	16.8	504	559
MARMONG POINT	3	59.3	178	162
MARYLAND	127	16.4	2080	2318
MARYVILLE	68	8.9	603	613
MAYFIELD	384	10.6	4075	4005
MAYFIELD EAST	67	9.4	628	653
MAYFIELD WEST	91	8	730	778
MEREWETHER	365	9.8	3590	3533
MEREWETHER HEIGHTS	45	11.2	503	511
MINMI	4	57	228	245
MIRRABOOKA	3	102.7	308	313
MORISSET	7	90	630	676
MORISSET PARK	3	44.7	134	114
MOUNT HUTTON	45	17.6	790	848
NEW LAMBTON	383	10	3822	3809
NEW LAMBTON HEIGHTS	56	16.4	920	883
NEWCASTLE	179	1.1	200	539
NEWCASTLE EAST	36	2.5	90	249
NEWCASTLE WEST	89	1.3	120	283
NORTH LAMBTON	113	11.6	1310	1322
PELICAN	16	20	320	382
RANKIN PARK	45	21.2	956	938
RATHMINES	3	298.3	895	905
REDHEAD	5	184.8	924	1199
SANDGATE	3	50	150	160
SEAHAMPTON	3	33.3	100	182
SHORTLAND	57	24.4	1389	1366
SILVERWATER	2	67.5	135	117

SUBURB	No. of surveyed sites	Survey rate / Multiple	Total Building Count	Cadastre Count
SPEERS POINT	48	25	1202	1203
STOCKTON	196	8.2	1612	1645
SUNSHINE	2	121	242	241
SWANSEA	73	26.1	1908	1895
TARRO	5	120.4	602	584
TERALBA	23	21.7	500	505
THE HILL	35	13.4	470	392
THE JUNCTION	45	8.4	380	363
TIGHES HILL	85	9.4	795	785
TINGIRA HEIGHTS	3	246.7	740	733
TORONTO	9	266.7	2400	2341
VALENTINE	5	364.8	1824	2044
WALLSEND	251	18.2	4570	4461
WANGI WANGI	8	165	1320	1326
WARABROOK	53	9.1	483	585
WARATAH	151	10.7	1615	1585
WARATAH WEST	107	10	1070	1058
WARNERS BAY	6	439.8	2639	2535
WEST WALLSEND	7	109.7	768	743
WHITEBRIDGE	61	14.8	900	862
WICKHAM	61	4.1	250	410
WINDALE	5	213.6	1068	1057
WINDERMERE PARK	3	101	303	298
WOODRISING	3	177	531	523
WYEE	3	166.7	500	726
WYEE POINT	3	115	345	960
YARRAWONGA PARK	3	67	201	205
TOTAL	6339		117652	

Table G - 2 : Building counts by postcode and suburb

POSTCODE	SUBURB	CENSUS	Cadastre	Building Count	Difference
2264	BALCOLYN	3700	5114	5040	74
	BONNELLS BAY				
	BRIGHTWATERS				
	DORA CREEK				
	ERARING				
	MIRRABOOKA				
	MORISSET				
	MORISSET PARK				
	SILVERWATER				
	SUNSHINE				
	WINDERMERE PARK				
	YARRAWONGA PARK				
2265	COORANBONG	1511	951	510	441
2267	WANGI WANGI	1029	1326	1320	6
2278	BARNSLEY	////	1552	1541	11
	KILLINGWORTH				
2280	BELMONT	8333	8253	8388	-135
	BELMONT NORTH				
	CROUDACE BAY				
	FLORAVILLE				
	JEWELLS				
	MARKS POINT				
	VALENTINE				
2281	BLACKSMITHS	4517	4609	4522	87
	CAVES BEACH				
	PELICAN				
	SWANSEA				
2282	ELEEBANA	4714	4911	5102	-191
	LAKELANDS				
	WARNERS BAY				
2283	ARCADIA VALE				
	BALMORAL				
	BLACKALLS PARK				

POSTCODE	SUBURB	CENSUS	Cadastre	Building Count	Difference
	BOLTON POINT	7665	9131	8620	511
	BUTTABA				
	CAREY BAY				
	COAL POINT				
	FASSIFERN				
	FENNELL BAY				
	FISHING POINT				
	KILABEN BAY				
	RATHMINES				
	TORONTO				
2284	ARGENTON	3978	4133	4126	7
	BOOLAROO				
	BOORAGUL				
	MARMONG POINT				
	SPEERS POINT				
	TERALBA				
	WOODRISING				
2285	CARDIFF	8305	8937	8899	38
	CARDIFF HEIGHTS				
	CARDIFF SOUTH				
	EDGEWORTH				
	GLENDALE				
	MACQUARIE HILLS				
2286	ESTELVILLE	1254	1699	1545	154
	HOLMESVILLE				
	SEAHAMPTON				
	WEST WALLSEND				
2287	BIRMINGHAM GARDENS	9488	10578	10193	385
	ELERMORE VALE				
	FLETCHER				
	MARYLAND				
	MINMI				
	RANKIN PARK				
	WALLSEND				
2289	ADAMSTOWN				

POSTCODE	SUBURB	CENSUS	Cadastre	Building Count	Difference
	ADAMSTOWN HEIGHTS				
	GARDEN SUBURB				
	HIGHFIELDS	6829	6909	6856	53
	KOTARA				
	KOTARA SOUTH				
2290	BENNETTS GREEN				
	CHARLESTOWN				
	DUDLEY				
	GATESHEAD				
	HILLSBOROUGH				
	KAHIBAH	11665	11440	11278	162
	MOUNT HUTTON				
	REDHEAD				
	TINGIRA HEIGHTS				
	WHITEBRIDGE				
2291	MEREWETHER				
	MEREWETHER HEIGHTS	5563	4407	4473	-66
	THE JUNCTION				
2292	BROADMEADOW	687	967	705	-262
2293	MARYVILLE	816	1023	853	170
	WICKHAM				
2294	CARRINGTON	693	655	880	-225
2295	STOCKTON	1840	1645	1612	33
2296	ISLINGTON	622	800	898	-98
2297	TIGHES HILL	674	785	795	-10
2298	GEORGETOWN				
	WARATAH	3737	3471	3505	-34
	WARATAH WEST				
2299	JESMOND				
	LAMBTON	4109	4023	4002	21
	NORTH LAMBTON				
2300	BAR BEACH				
	COOKS HILL				
	NEWCASTLE	3835	2135	1982	153

POSTCODE	SUBURB	CENSUS	Cadastre	Building Count	Difference
	NEWCASTLE EAST				
	THE HILL				
2302	NEWCASTLE WEST	21	283	120	163
2303	HAMILTON	4308	3071	3624	-553
	HAMILTON EAST				
	HAMILTON NORTH				
	HAMILTON SOUTH				
2304	MAYFIELD	5871	6181	6066	115
	MAYFIELD EAST				
	MAYFIELD WEST				
	SANDGATE				
	WARABROOK				
2305	NEW LAMBTON	4720	4692	4742	-50
	NEW LAMBTON HEIGHTS				
2306	WINDALE	834	1057	1068	-11
2307	SHORTLAND	1369	1366	1389	-23
2322	BERESFIELD	4700	2137	2040	97
	BLACK HILL				
	HEXHAM				
	TARRO				
2259	WYEE		1686	845	841
	WYEE POINT				

The sampling rate determines the level of uncertainty in the inventory data. Hence, the risk assessment results are expected to be less uncertain for the Newcastle region. However, due to the random nature of the spread of building stock within a community, the uncertainty can not be well defined by statistical means.

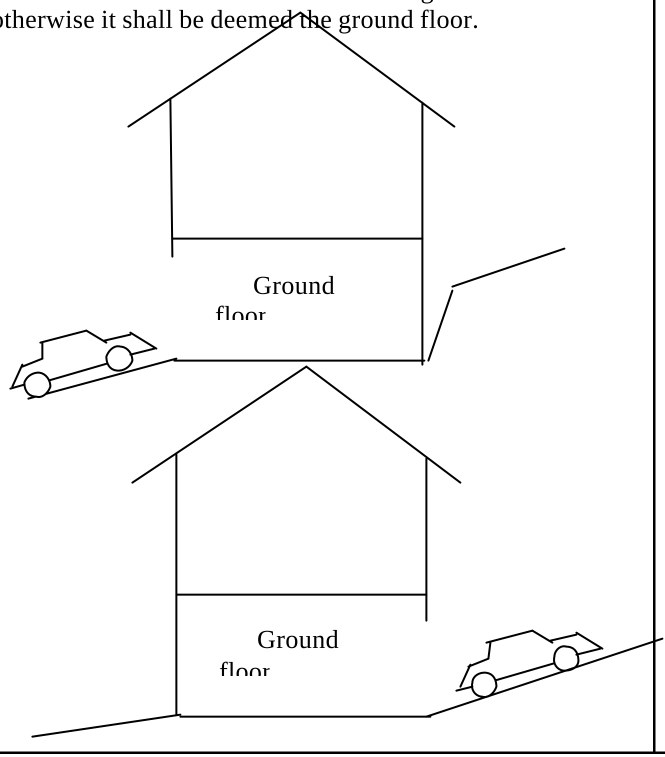
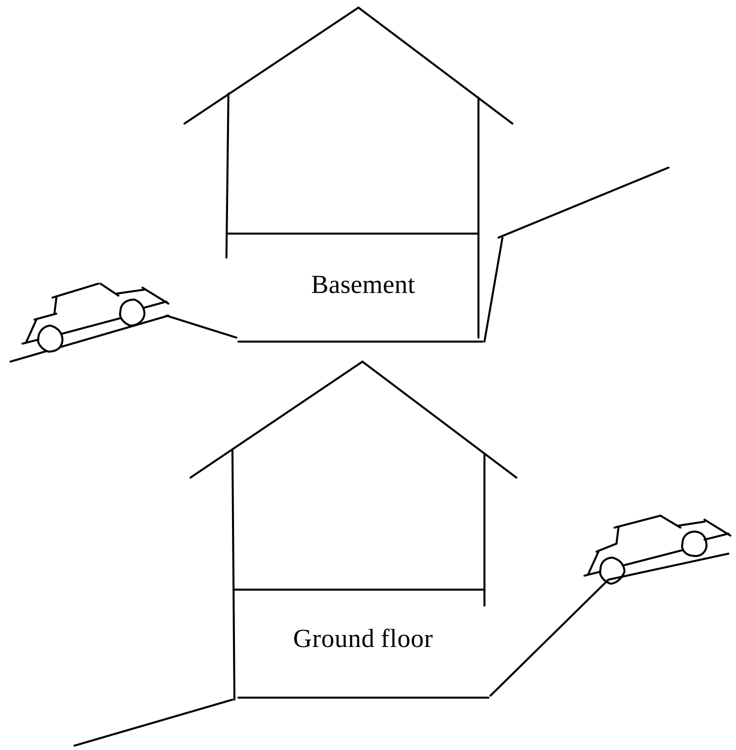
An attempt was made to survey all large buildings and special buildings such as fire stations, ambulance stations during the survey. The building data collected includes location, age, construction types, dimensions, usage, vulnerable features, irregularities and the nature of adjacent buildings on the same site. The data items and instructions given to surveyors are listed in detail in Table G - 3 to Table G - 12.

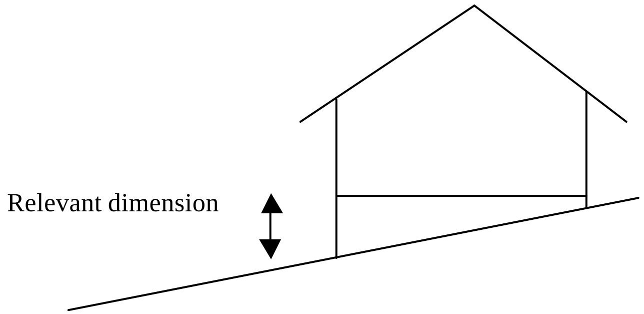
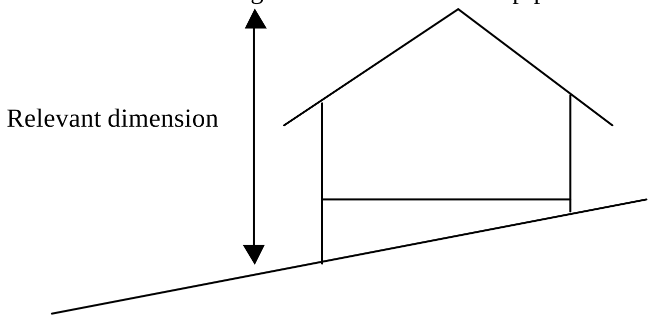
Table G - 3 : Address

Field	Data (ENTER = enter text, CHOOSE = choose from list)	Relevance
Repeat site	Tick indicates YES, otherwise NO You must be absolutely sure that the building is 100% the same as the last one surveyed (including other features). Fill in the first table only.	To reduce the boredom of the surveyor
Construction site	Tick indicates YES, otherwise NO. Some sites will be subject to construction. Fill in the first table only.	Construction sites are more highly prone to wind damage.
Photos taken	ENTER number Take a photo of the building, trying to get the foundations, roof, front wall and one side wall in the picture. Take a second photo only if absolutely necessary. A picture of the streetscape must be taken for every address which ends with the numerals "05".	Photos taken so that data can be easily checked later without necessarily going back out into the field. Photos of streetscapes will allow qualitative judgement of the aesthetic importance of the structure.
Today's date	ENTER number (today's date is default) Today's date is defaulted so just tick the box.	Date recorded since buildings may be demolished, or changed in some way in the future. Date is also useful for bookkeeping purposes.
Address number	CHOOSE from "OTHER,UNKNOWN,5,15,25,35,45,55,65,75,85,95,105,115,125,135, 145,155,165,175,185,195,205" In case of "OTHER", ENTER the number, or if the building occupies more than one address enter a range: ie. "3-11" Survey every building with an address which ends with the numeral	Address allows spatial location in the risk analysis (checked also by coordinates). Sufficient numbers of properties are to be surveyed to give the sample statistical certainty as discussed previously.

	"5" (or buildings with a range of addresses which includes an address ending in "5" within the range. ie. "3-11"). If buildings are large and are occupied by single entities, the address of the building may be specified as a single address number instead of a range: ie. You may have addresses 95, 101,113,117,121,125 in that sequence. In this case, survey the buildings which immediately follow where an address ending in "5" should be. In this case you would survey buildings 95, 113 (follows where 105 should be), 117 (follows where 115 should be) and 125. Also survey all other buildings which are: EDUCATION, MEDICAL or SAFETY types of any size. Important (can contain more than 100 people or service more than 10,000 people per day). Potentially hazardous to large amounts of people. Ie. storage of toxic chemicals/explosive material.	All important and large buildings are important in terms of risk assessment since the community is reliant on them.
Street	CHOOSE from list, OTHER, UNKNOWN A list of streets should be uploaded for the area you are surveying. If the street name does not exist in the list then choose "OTHER" and type the street name in the comment field.	Address allows spatial location in the risk analysis (checked also by coordinates).
Suburb	CHOOSE from list, OTHER, UNKNOWN A list of suburbs should be uploaded for the area you are surveying. If the suburb name does not exist in the list then choose "OTHER" and type the street name in the comment field.	Address allows spatial location in the risk analysis (checked also by coordinates).
Age	CHOOSE from up to 1900, 1901 up to 1930, 1931 up to 1950, 1951up to 1960, 1961 up to 1970, 1971 up to 1980, 1981 up to 1990, 1991 up to 2000, UNKNOWN Make your best guess.	Building categories in risk assessment may be typified by age.
Living units	CHOOSE from 0,1,2,3,4,6,8,10,15,20,30,50,100+, UNKNOWN The number of family living units. Look at letterbox.	Important for estimating the numbers of lives at risk.

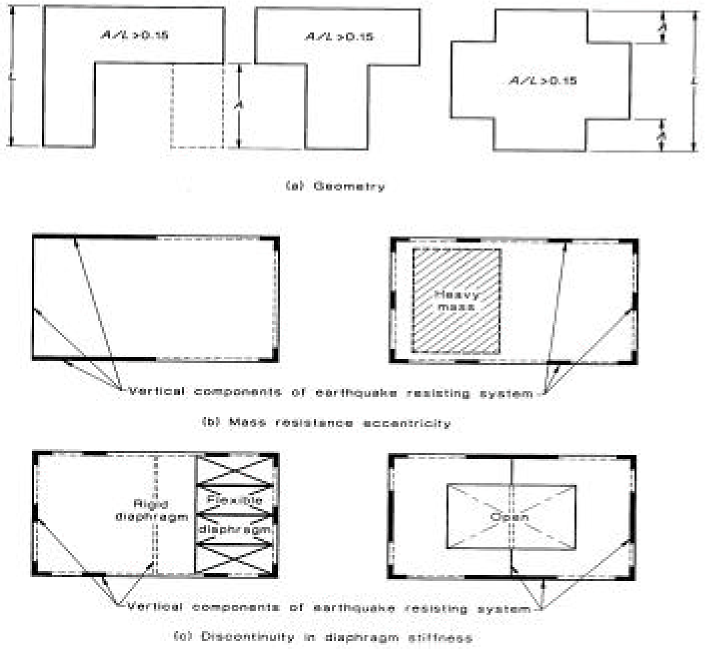
Table G - 4 : Size

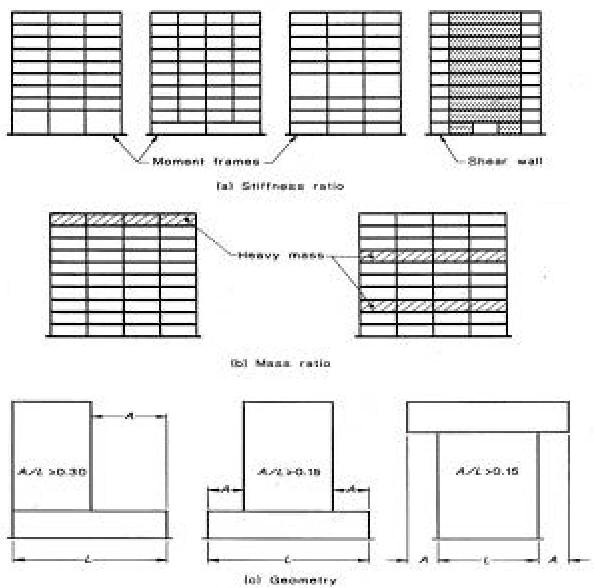
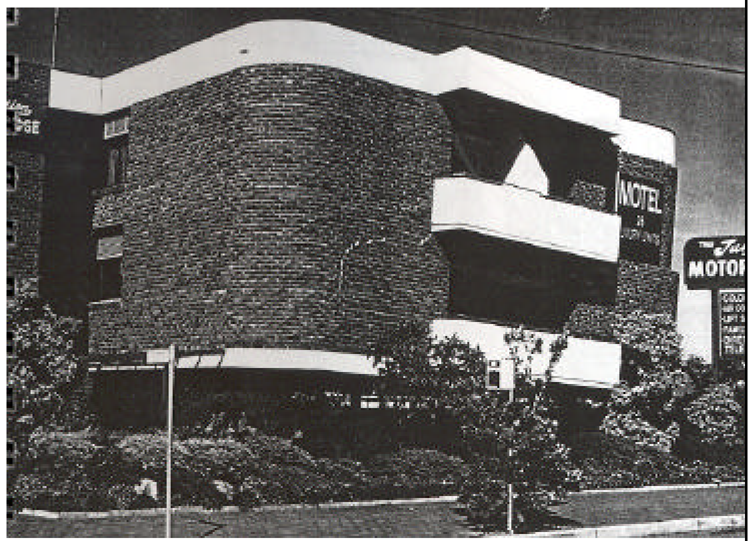
Field	Data (ENTER = enter text, CHOOSE = choose from list)	Relevance
Basements	CHOOSE from 0,1,2,3,4,6,8,10+, UNKNOWN Multi-storey buildings are more likely to have one or more basements – enter the building if publicly accessible and observe the number of basements indicated by the lift.	Important mainly for flood risk assessment.
Storeys	CHOOSE from 0,1,2,3,4,6,8,10,20,40,60,100+, UNKNOWN The number of storeys includes the ground floor. A storey which has its floor level below the ground's natural surface for at least two side faces of the building shall be deemed a basement, otherwise it shall be deemed the ground floor. Ie. 	Average storey heights can be estimated which may be of importance for flood risk assessment. 

Ground floor height (m)	CHOOSE from 0,0.3,0.6,1.0,1.5,2,2.5, UNKNOWN Maximum distance from the ground surface to the level of the ground floor. Ie. 	Important in terms of flood risks. Also important in earthquakes, where this dimension will describe the slenderness of the foundations and may imply the foundation type where it can't be seen due to a facade.
Roof height (m)	CHOOSE from 0,2,2.5,3,4,5,6,8,10,12,15,20,30,50,100+, UNKNOWN Maximum distance from the ground surface to the top point of the roof. Ie. 	Important in terms of most hazards. For floods, the roof could be the last resort for residents. For wind, height implies wind loading. For earthquakes, height implies structure stiffness and consequently expected seismic performance.

Floor plan width (m)	CHOOSE from 3,5,8,10,12,15,20,30,50,100+, UNKNOWN Estimating by pacing out the distance.	Important for estimating the wind or earthquake load attracted to the structure and for also estimating the structural stiffness. Floor plan area can be determined which can be used to imply the value of the building.
Floor plan depth (m)	CHOOSE from 3,5,8,10,12,15,20,30,50,100+, UNKNOWN Estimate by looking at the side wall and comparing to the estimate of floor plan width.	As above.
Distance to nearest neighbouring building	CHOOSE from 0,0.1,0.3,0.5,1,2,4,10,20+, UNKNOWN If nearest neighbouring building is abutting then distance is zero. A neighbouring building may be one on the same property if there is more than one building on the property.	Important in terms of the potential for pounding in earthquakes between adjacent structures. Also important in terms of the shielding of wind. Also important regarding fire spread.

Table G - 5 : Construction

Field	Data (ENTER = enter text, CHOOSE = choose from list)	Relevance
Plan regularity	CHOOSE from REGULAR, IRREGULAR, UNKNOWN REGULAR floor plans are approximately of rectangular, triangular or circular shape, with stiffness and mass evenly distributed. Most houses will fall in this category. IRREGULAR floor plans may be assessed by considering the examples given here (adopted from AS1170.4): 	Mainly important in terms of earthquake response. Irregular structures have seismic demand concentrations.

Vertical regularity SOFT STOREY →	CHOOSE from REGULAR, IRREGULAR, SOFT STOREY, UNKNOWN REGULAR vertical plans are approximately of rectangular or triangular shape, with stiffness and mass evenly distributed. Most houses will fall in this category. IRREGULAR vertical plans and SOFT STOREYS may be assessed by considering the examples given here (adopted from AS1170.4): (A SOFT STOREY is the first example shown) 	Mainly important in terms of earthquake response. Irregular and soft storey structures have seismic demand concentrations. Example:  *Figure G - 2: The importance of soft storeys. The ground floor consisted mainly of slender reinforced concrete columns. Seismic damage was concentrated in this soft storey, resulting in demolition of the building (Melchers, 1990)*
Foundations	CHOOSE from SLAB ON GROUND, BRICK WALL, BRICK PIER, CONCRETE WALL, CONCRETE PIER, TIMBER WALL, TIMBER PIER, METAL STRUTS, OTHER, UNKNOWN Note only what you see.	Important in terms of seismic response. Some foundation types (such as slender unbraced piers) are particularly prone to behave like a soft-storey.

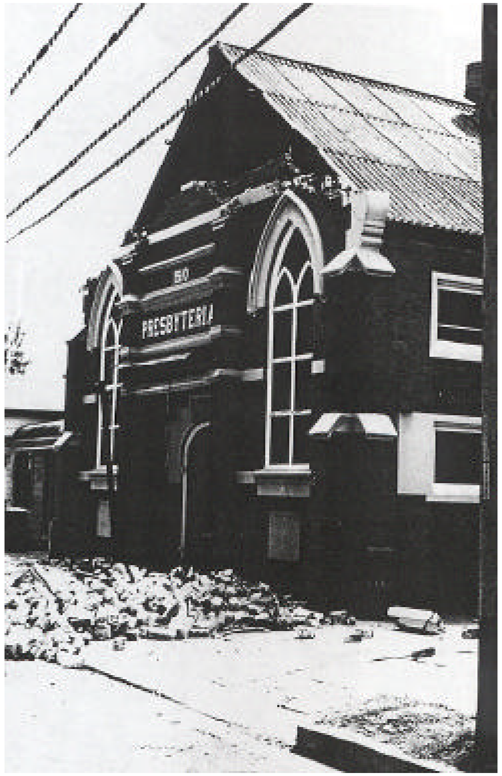
Walls	CHOOSE from BRICK, TIMBER, MASONRY, STONE, FIBRO, METAL, PRE-CAST CONCRETE, REINFORCED CONCRETE, MASONITE, GLASS, R/C FRAME WITH BRICK/MASONRY INFILL, OTHER, UNKNOWN Note only what you see.	Building categories in risk assessment may be typified by walls. Earthquake performance is often characterised by the stiffness, strength, displacement capacity and ductility of walls. Example:  *Figure G - 3: Importance of wall type: Brick walls are susceptible to racking damage from earthquakes due to brittle material properties (Melchers, 1990)*
Roof	CHOOSE from TILE, CONCRETE, METAL, SLATE, FIBRO, TIMBER, OTHER, UNKNOWN Note only what you see.	Important in terms of the determination of a structure's fundamental period which is of most importance for seismic performance. Different material types may also be more prone to wind and hail damage.

Table G - 6 : Other features - 1

Field	Data (ENTER = enter text, CHOOSE = choose from list)	Relevance
Windows	CHOOSE from LARGE, MEDIUM, SMALL, NONE, OPEN, UNKNOWN LARGE is defined as windows which occupy more than 40% of the area of the most heavily windowed face. MEDIUM is defined as windows which occupy between 15% and 40% of the area of the most heavily windowed face. SMALL is defined as windows which occupy less than 15% of the area of the most heavily windowed face. NONE is defined as windows which occupy less than 2% of the area of the most heavily windowed face. OPEN is defined as when there are voids in the building.	Similar importance as soffit linings in terms of wind. Entry of wind and rain into the building can lead to excessive damage. May also be important in terms of hail damage.
Window protectors	Tick indicates YES, it does exist, otherwise, NO, it does not exist.	 *Figure G - 4: Window protectors greatly reduce the vulnerability of buildings to wind damage. Ref(Boughton, 1999)*

Verandah/awnings	CHOOSE from CANTILEVER, PROPPED, SUSPENDED Only significant verandahs and awnings which are not part of the roof structure should be noted. If no choice is made, then assumed to not exist.	Cantilever verandahs perform poorly when subject to high winds. Propped and suspended verandahs may perform slightly better. Shop awnings suspended by attachment to brick parapets have performed poorly when subject to earthquake loading (Melchers, 1990).
Brick chimneys	CHOOSE the chimney height from 0.3,0.6,1,1.5,2,2.5,3,5,10,20,30+ If no choice is made, then assumed to not exist.	Element highly vulnerable to earthquake loading.  *Figure G - 5: Importance of chimneys. Chimneys are highly vulnerable to earthquakes (Melchers, 1990)*
Brick parapets	CHOOSE the parapet height from 0.3,0.6,1,1.5,2,2.5,3,5,10,20,30+ If no choice is made, then assumed to not exist.	Element highly vulnerable to earthquake loading.

Brick fences	CHOOSE the fence height from 0.3,0.6,1,1.5,2,2.5,3,5,10,20,30+ If no choice is made, then assumed to not exist.	Element highly vulnerable to earthquake loading.

Gable roof with brick ends	Tick indicates YES, it does exist, otherwise, NO, it does not exist.	Gable roofs with brick end walls are more prone to earthquake damage. Example:  *Figure G - 6: The importance of gable roofs. The gable end of this roof, constructed from bricks failed out-of-plane under seismic loading (Melchers, 1990)*

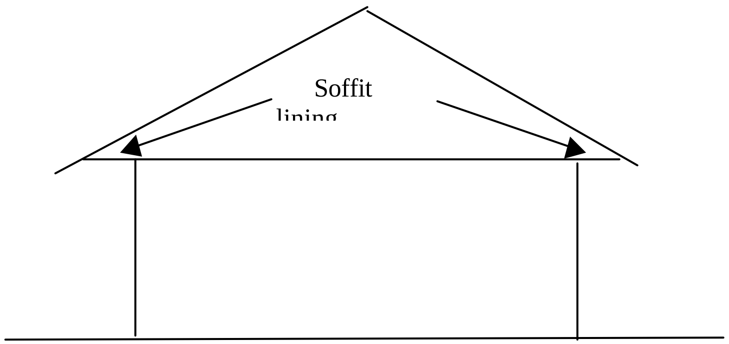
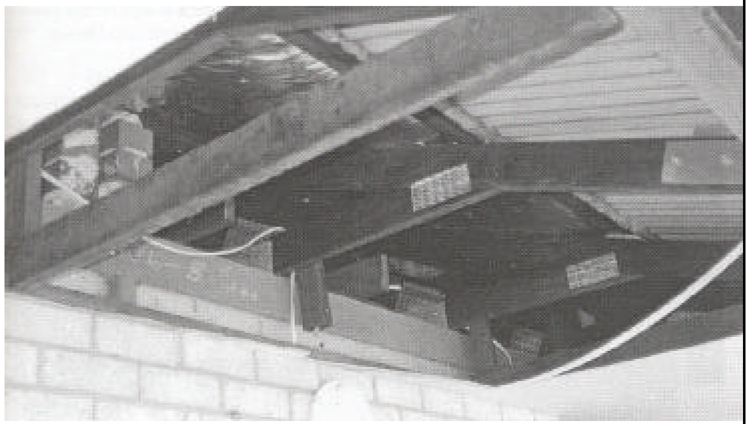
Soffit	Tick indicates YES, it does exist, otherwise, NO, it does not exist. The location of the soffit lining is indicated here:  	Important in terms of wind. Many instances have been observed of wind blowing through the soffit lining which leads to internal pressurisation of the building (and possible blow off of roof) and ingress of water which can incur severe damage to contents. Example:  *Figure G - 7: The importance of soffit lining. Failure of soffit lining allows the entry of wind and rain, leading to extensive internal and roof damage. Ref(Reardon et al., 1999)*
Water tank	Tick indicates YES, it does exist, otherwise, NO, it does not exist.	Readily available supply of water to fight fire, hence reducing risk from fire hazards.
Ventilators	Tick indicates YES, it does exist, otherwise, NO, it does not exist.	Existence of ventilators increases the risk to wind damage, since water can be blown in.

Table G - 7 : Other features - 2

Parking structure – type	CHOOSE from IN BASEMENT, IN GROUND FLOOR, ATTACHED GARAGE, DETACHED GARAGE, CARPORT	 *Figure G - 8: Importance of garages. The wind damage caused to this garage will cost a significant amount of money to repair. Ref(Reardon et al., 1999)*
Parking structure – car spaces	CHOOSE from 1,2,3,4,6,8,10,20,50,100,200,500,1000+, UNKNOWN The number of car spaces.	The number of car spaces allows the quantity of elements at risk to be quantified. Parking structures also reduce the vulnerability of cars to hail damage.
Parking structure - material	CHOOSE from SAME AS PRIMARY BUILDING, BRICK, TIMBER, MASONRY, STONE, FIBRO, METAL, PRE-CAST CONCRETE, REINFORCED CONCRETE, MASONITE, GLASS, R/C FRAME WITH BRICK/MASONRY INFILL, OTHER, UNKNOWN The material which is supporting the roof, should it be walls, columns, or struts, is the material which should be noted.	Different materials perform differently in terms of stiffness, strength, displacement capacity and ductility.
Other structure – 1 – number	CHOOSE from 1,2,3,4,6,8,10,20,50,100,200,500,1000+, UNKNOWN The number of other structures. Do not include garden sheds and cubbies.	Other structures at the address may have significant levels of risk.

Other structure – 1 - relative size	CHOOSE from SAME, HALF, QUARTER, MUCH SMALLER, UNKNOWN The size relative to the primary building. The primary building should be the largest building at the address.	The number of car spaces allows the quantity of elements at risk to be quantified. Parking structures also reduce the vulnerability of cars to hail damage.
Other structure – 1 – material	CHOOSE from SAME AS PRIMARY BUILDING, BRICK, TIMBER, MASONRY, STONE, FIBRO, METAL, PRE-CAST CONCRETE, REINFORCED CONCRETE, MASONITE, GLASS, R/C FRAME WITH BRICK/MASONRY INFILL, OTHER, UNKNOWN The material which is supporting the roof, should it be walls, columns, or struts, is the material which should be noted.	Different materials perform differently in terms of stiffness, strength, displacement capacity and ductility.
Other structure – 2 – number	CHOOSE from 1,2,3,4,6,8,10,20,50,100,200,500,1000+, UNKNOWN The number of other structures. Do not include garden sheds and cubbies.	Other structures at the address may have significant levels of risk. There may be more than one other significant class of other structures. The survey form does not allow more than two classes of other structures.
Other structure – 2 - relative size	CHOOSE from SAME, HALF, QUARTER, MUCH SMALLER, UNKNOWN The size relative to the primary building. The primary building should be the largest building at the address.	The number of car spaces allows the quantity of elements at risk to be quantified. Parking structures also reduce the vulnerability of cars to hail damage.
Other structure – 2 – material	CHOOSE from SAME AS PRIMARY BUILDING, BRICK, TIMBER, MASONRY, STONE, FIBRO, METAL, PRE-CAST CONCRETE, REINFORCED CONCRETE, MASONITE, GLASS, R/C FRAME WITH BRICK/MASONRY INFILL, OTHER, UNKNOWN The material which is supporting the roof, should it be walls, columns, or struts, is the material which should be noted.	Different materials perform differently in terms of stiffness, strength, displacement capacity and ductility.

Table G - 8 : Confidence (sheet 12) - compulsory

Field	Data (ENTER = enter text, CHOOSE = choose from list)	Relevance
Confidence in data*	CHOOSE from HIGH, MEDIUM, LOW This is the confidence you have in your data.	Allows the uncertainty in the data to be quantified. Also highlights problems to the survey supervisor.
Comments	ENTER text Put in any comments you like. Maybe a comment about streetscape, particular unusualities not covered by the survey, etc.	Allows comments to be made which can not be expressed by any other field. Useful for development of the survey form.

Table G - 9 : Building Use - compulsory

Field	Data (ENTER = enter text, CHOOSE = choose from list)	Relevance
Industry	See the supplementary feature attribute table, UNKNOWN	Building use implies importance to the community in risk assessment. Building types may also be typified by building use.
Category	See the supplementary feature attribute table, UNKNOWN	Building use implies importance to the community in risk assessment. Building types may also be typified by building use.
Type	See the supplementary feature attribute table, UNKNOWN	Building use implies importance to the community in risk assessment. Building categories in risk assessment may be typified by building use.

Table G - 10: Supplementary feature attribute table

Industry	Category	Type
ACCOMMODATION	HOUSE, UNITS, FLATS, HOTEL, MOTEL, RESORT, HOSTEL, CARAVAN PARK	SINGLE, ATTACHED, MULTIPLE, DUPLEX
BUSINESS	FOOD, WHITEGOODS, AUTOMOBILES, ELECTRONICS, CLOTHING, SERVICE, MULTIPLE	OFFICE, SHOP, MALL, SUPERMARKET, SERVICE STATION
COMMUNITY	ART, SPORT, RELIGION, HISTORY, SCIENCE, GENERAL	GALLERY, HALL, LIBRARY, MONUMENT, MUSEUM, TOILET, WORSHIP PLACE, CLUB, GRANDSTAND, STADIUM, CENTRE
EDUCATION	PRE-SCHOOL, CHILDCARE, SCHOOL, UNIVERSITY, COLLEGE, CONVENT	CLASSROOM, HALL, LIBRARY, CAMPUS, CENTRE, OFFICE, THEATRE
GOVERNMENT	LOCAL, STATE, FEDERAL	OFFICE, SHOP
MANUFACTURING	FOOD, WHITEGOODS, AUTOMOBILES, ELECTRONICS, CLOTHING	FACTORY, PLANT, MILL
MEDICAL	DENTIST, DOCTOR, SPECIALIST, NURSE, VET	HOSPITAL, SURGERY, CENTRE, HOME, CLINIC, HOSPICE

SAFETY	AMBULANCE, DEFENCE, FIRE, POLICE, SES	STATION, HEAD QUARTERS
STORAGE	FOOD, FUEL, CHEMICALS	DEPOT, WAREHOUSE
TRANSPORT	BUS, RAIL, SHIP, AIR	STATION, TERMINAL
UTILITY	ELECTRICITY, GAS, SEWERAGE, TELECOMMUNICATIONS, WATER	STATION, TOWER, EXCHANGE, RESERVOIR, PLANT

Table G - 11: Attributes – informative only. No input required

Field	Data (ENTER = enter text, CHOOSE = choose from list)	Relevance
All	All This is a list of all the data that has been input. No input is allowed here, however, the data may be checked.	Just for checking purposes.

Table G - 12: Geography – informative only. No input required

Field	Data (ENTER = enter text, CHOOSE = choose from list)	Relevance
GPS longitude	AUTOMATIC from GPS No input required here. Feeds your location in automatically from the differentiated GPS.	Allows data to be directly plotted on a map, and is also useful for crosschecking street addresses.
GPS latitude	AUTOMATIC from GPS No input required here. Feeds your location in automatically from the differentiated GPS.	Allows data to be directly plotted on a map, and is also useful for crosschecking street addresses.

Floor area can be used to estimate the value of property, hence the floor area represented by a surveyed point has been estimated by Equation 4.

Equation 4: Floor area calculation

$$\text{Floor area} = \text{width} \times \text{depth} \times \text{no. of storeys} \times \text{survey rate for the site} \times \text{a regularity factor}$$
$$\times \begin{pmatrix} 1 + (\text{no. of secondary buildings} \times \text{fraction of size relative to the primary building}) \\ + (\text{no. of tertiary buildings} \times \text{fraction of size relative to the primary building}) \end{pmatrix}$$

where,

$$\text{the regularity factor} = \begin{cases} 0.9 \text{ for a regular plan building} \\ 0.7 \text{ for an irregular plan building} \end{cases}$$

The spatial distribution of surveyed buildings according to external wall material is shown in Figure G - 9 to Figure G - 11. The distribution of vulnerable building details such as brick chimneys, brick parapets, brick gable end roofs and structural irregularity is shown in Figure G - 12 - Figure G - 18. The size of the building floor area represented by each survey point is shown in Figure G - 19 - Figure G - 21 with size denoted by colour.

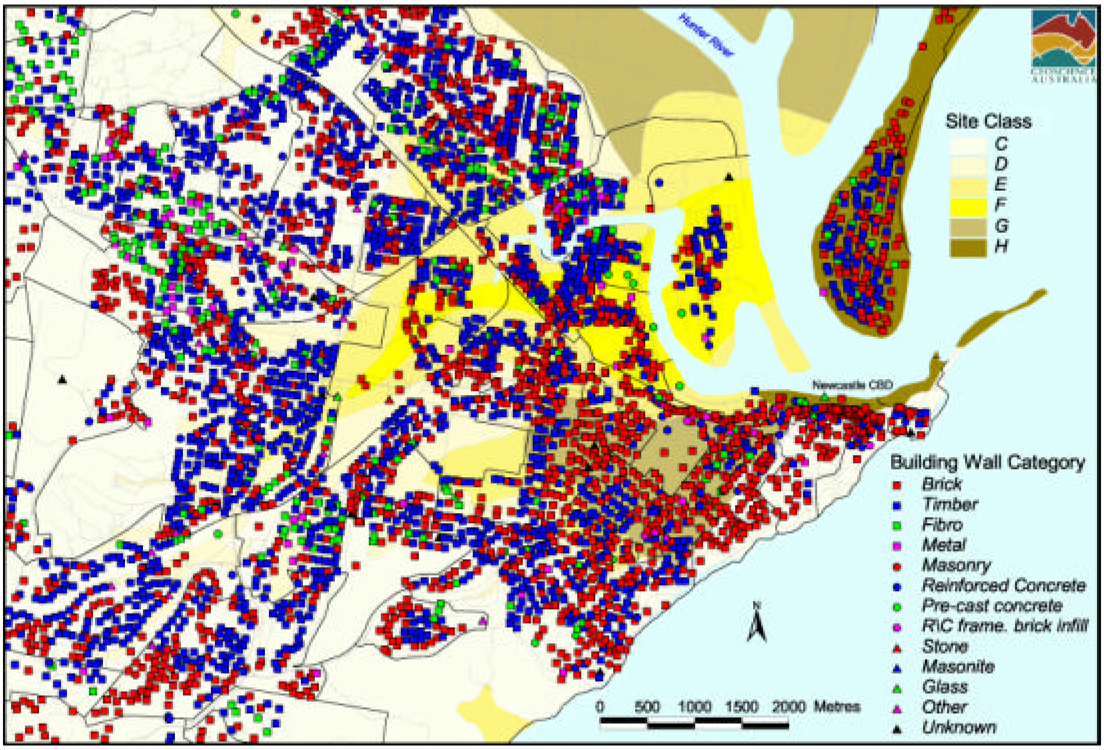


Figure G - 9: Distribution of buildings in the Newcastle area according to external wall type

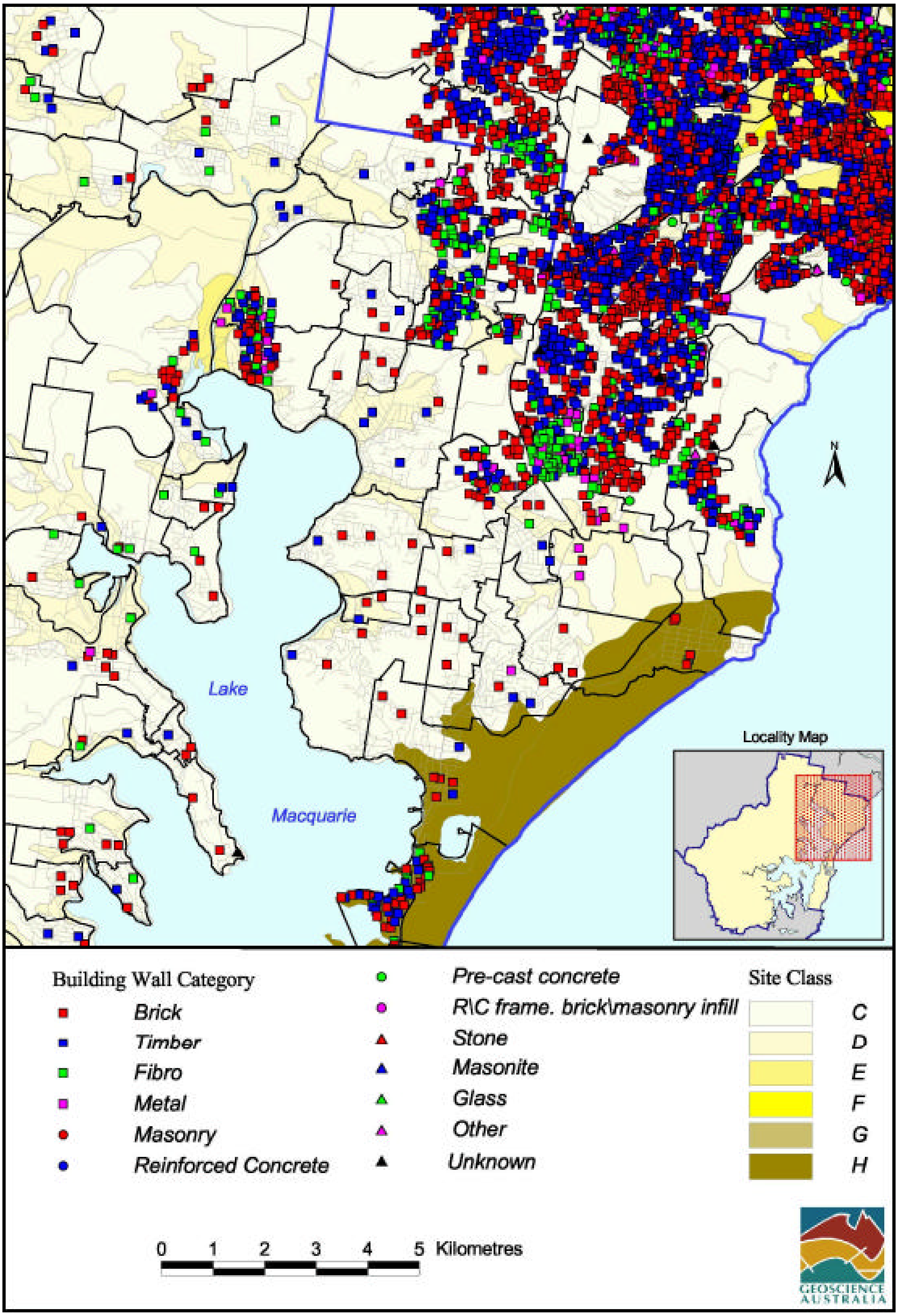


Figure G - 10: Distribution of buildings in the northern Lake Macquarie area according to external wall

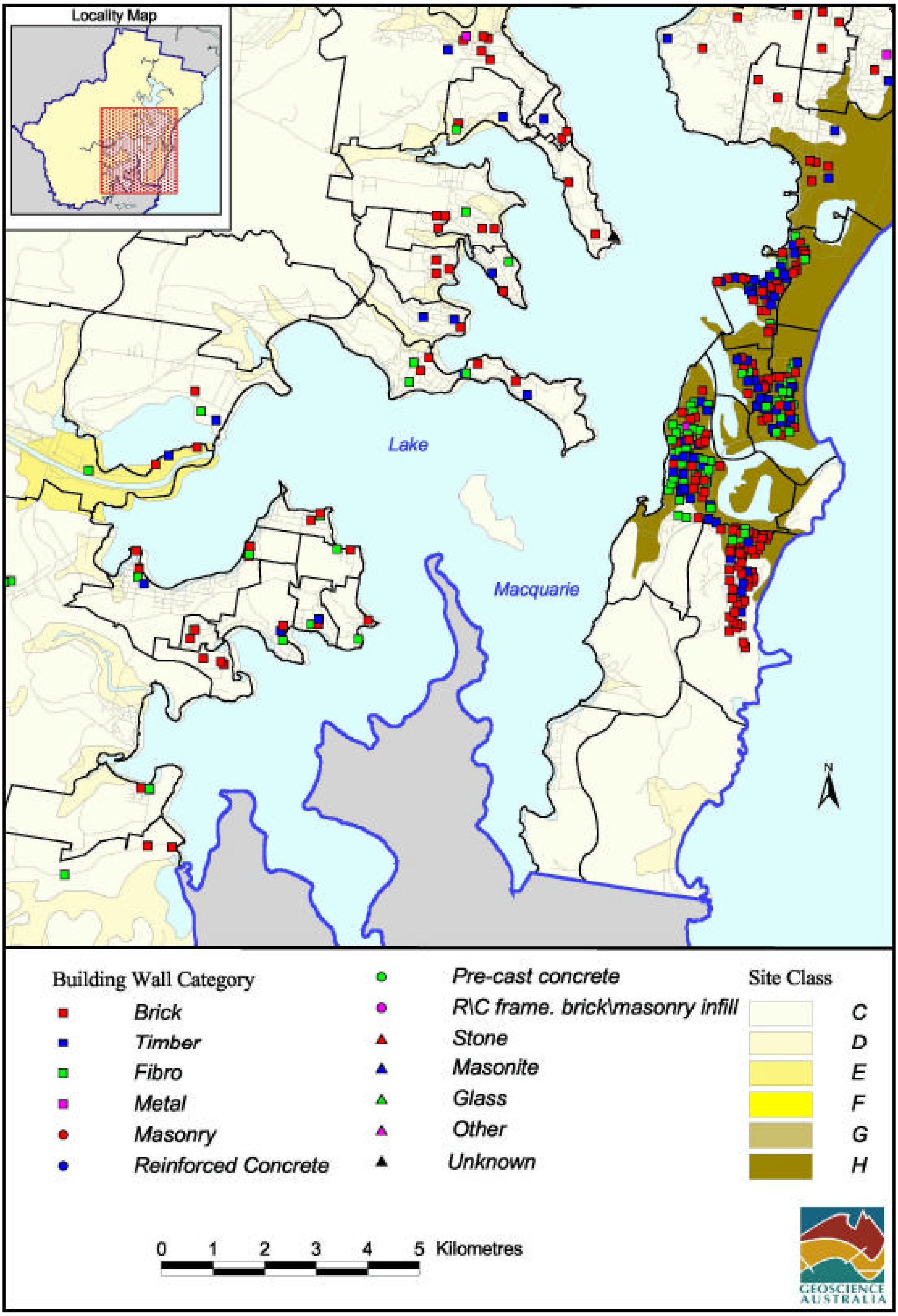


Figure G - 11: Distribution of buildings in the southern Lake Macquarie area according to external wall

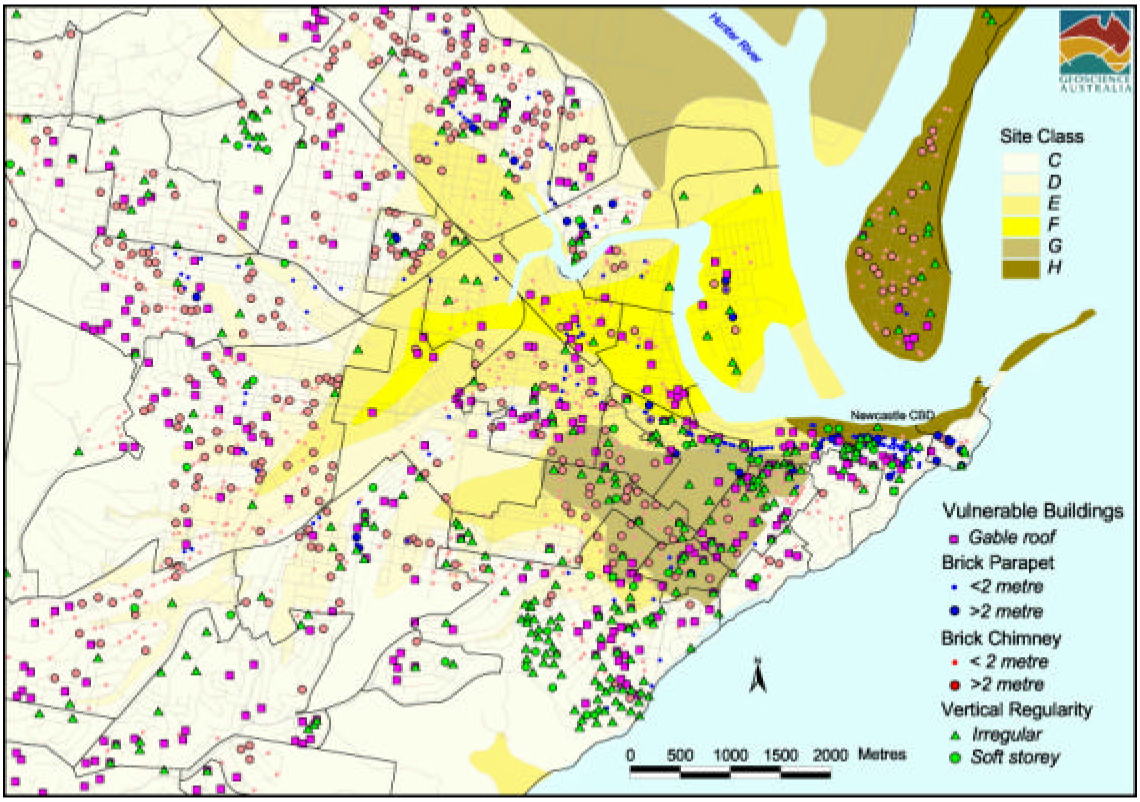


Figure G - 12: Distribution of vulnerable building elements in the Newcastle area

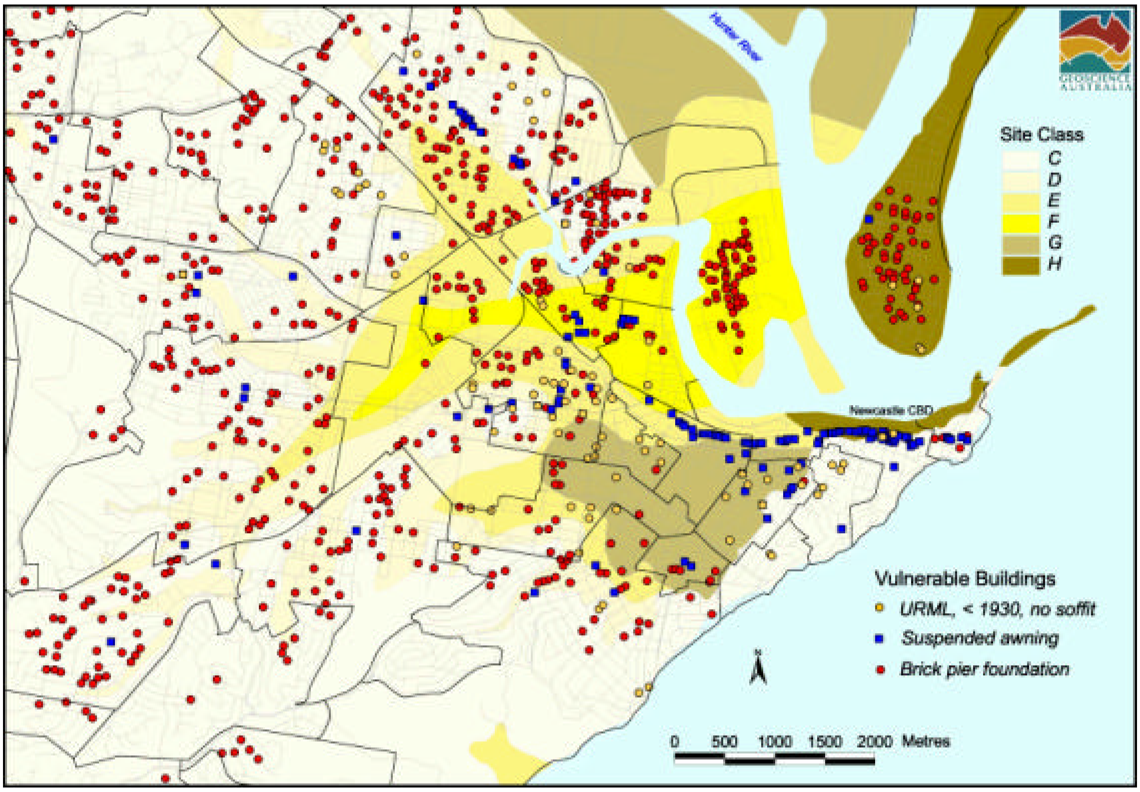


Figure G - 13: Distribution of vulnerable building elements in the Newcastle area

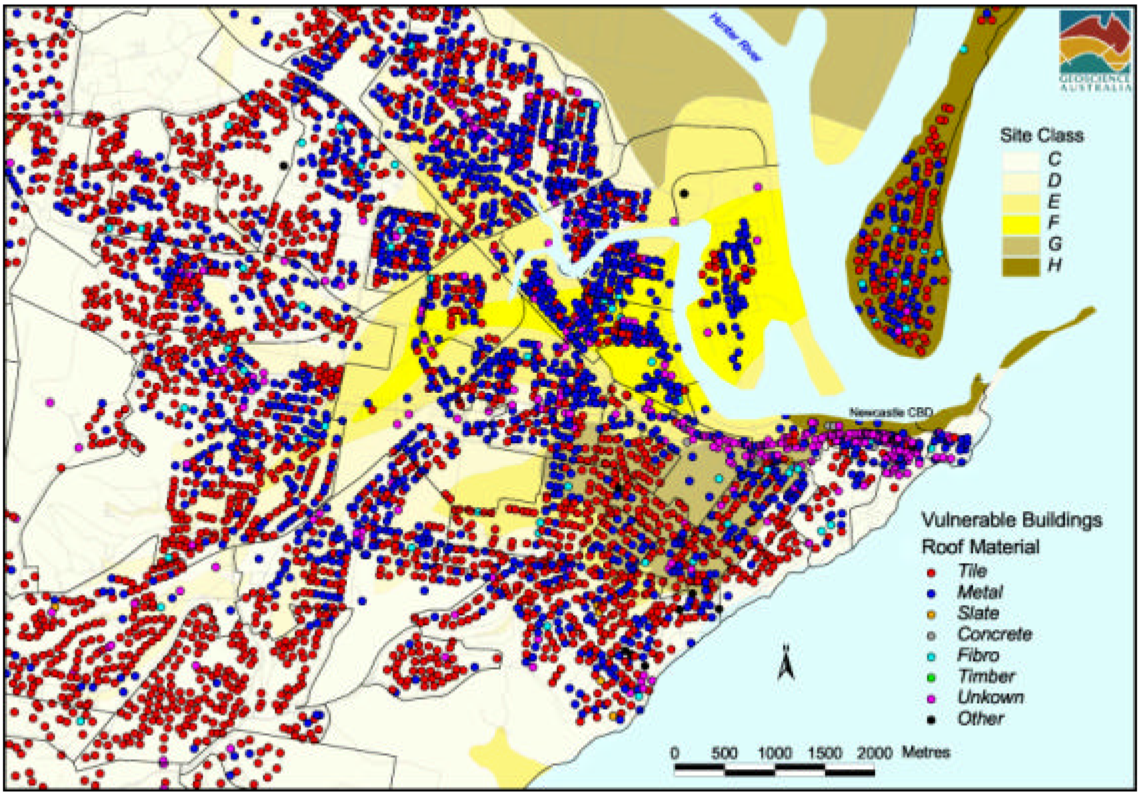


Figure G - 14: Distribution of vulnerable building elements in the Newcastle area

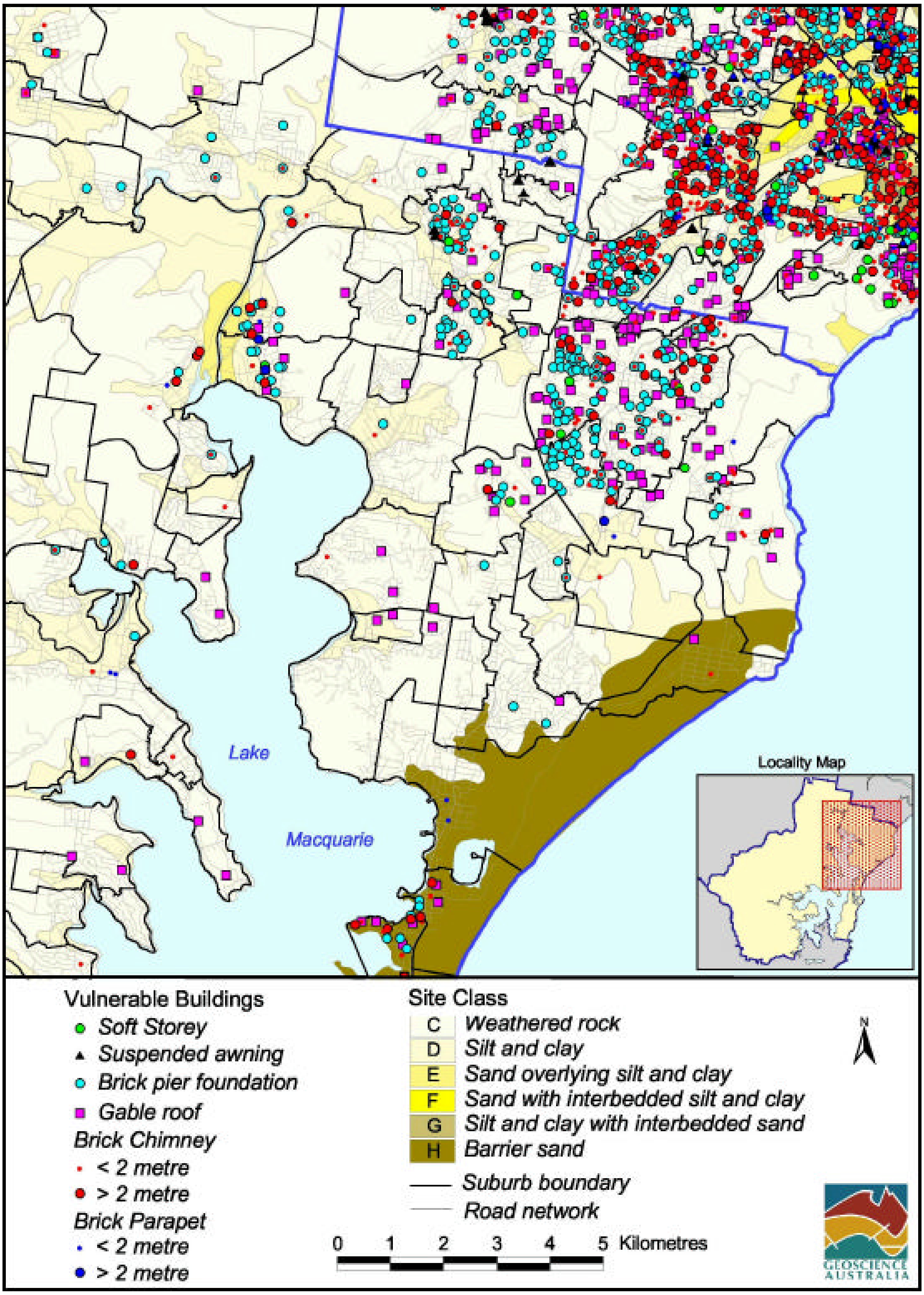


Figure G - 15: Distribution of vulnerable building elements in the northern Lake Macquarie area