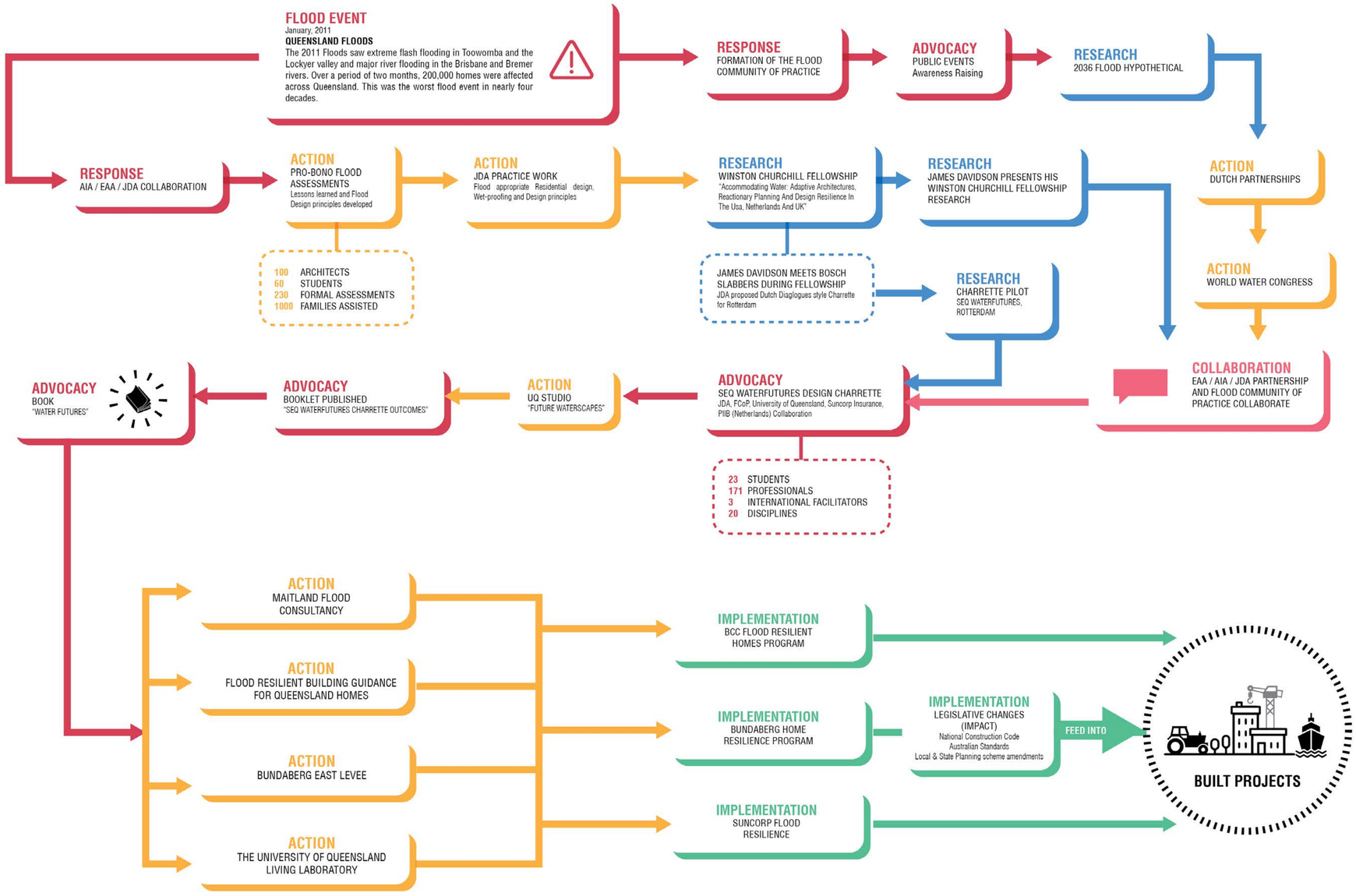
Living with Water

4th Water Sensitive Cities Conference

Dr James Davidson 26 March 2019



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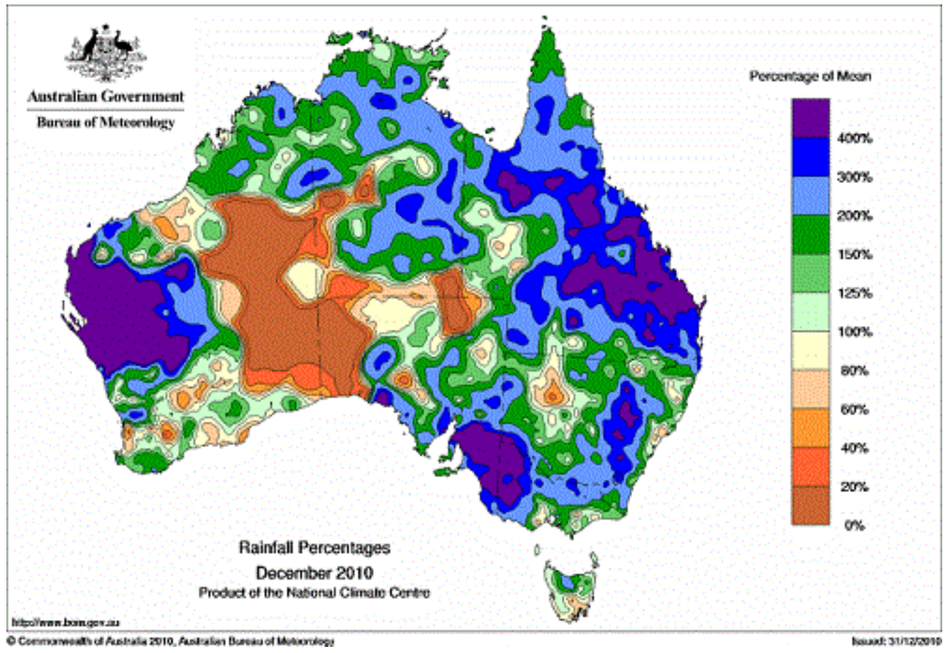
Australian Government
Bureau of Meteorology
Percentage of Mean
400%
300%
200%
150%
125%
100%
80%
60%
40%
20%
0%
Rainfall Percentages
December 2010
Product of the National Climate Centre
http://www.bom.gov.au
© Commonwealth of Australia 2010, Australian Bureau of Meteorology
Issued: 31/12/2010


airport
—runways—
Rockhampton
Fitzroy River
Bruce Highway—
1 km
N

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TYPE OF DAMAGE SEEN DURING EAA ASSESSMENTS

EAA assessments were geared towards providing a sense of direction for occupants in wading through not only rebuilding but also the planning process associated with reconstruction, something which the majority of homeowners had never faced previously.

emergency architects australia

BUILDING ASSESSMENT REPORT 2011 No: 0024

Emergency Architects Australia architects are assisting homeowners to assess the building damage caused to their houses by the flood, in order to help them organise affordable and functional repairs.

The volunteer architects will look over the house with the owners, help the owners get a good understanding of the full extent of damage (both apparent and perhaps hidden), and discuss options and opportunities for the repair work. They will also indicate any areas of concern which might need further assessment by other tradespeople or professionals before repairs are undertaken.

Report of Apparent Damage

Date of Visit: **26/02/2011**
Building address: **Unit 6, 5 Spalding Court, Goodna**
Local Authority: **Ipswich council**
Owner's Name **Wayne McIntosh** Occupant's Name: **Wayne McIntosh**

Phone Contact: **0407 017 123** Email Contact: wmcintosh@hotmail.com
Occupancy Description: **3** Bedrooms # **1** Bathrooms # **1** Living Areas #
Insurance Details: **Body corporate covers structure - but this only covers bricks**
GPS Co-ordinates: **S 27° 36' 45.5" E 152° 54' 02.4"**

1.0 TYPE OF BUILDING/CONSTRUCTION

1.1 Type:	[ ] Housing	[ ] Office	[ ] Shop
	[ ] Detached	[x] Townhouse	[ ] Apartment
1.2 Construction:	[ ] Timber Clad	[x] Brick Veneer	[ ] Cavity Brick
	[ ] Elevated Frame	[x] Slab on ground	[ ] Other

1.3 Number of storeys: **1**
1.4 Height of floors above ground:
1.5 Date/s of construction: **approx. 1995**
1.6 Heritage Status: [ ] Heritage Listed [ ] Character [x] None [ ] Unkown

2.0 FLOOD DAMAGE DATA

2.1 Height of flood above floor level: **3.6m**
2.2 Length of inundation: **4 days**
2.3 Date of initial inundation: **Very late 11/01/11**
2.4 Number of people displaced/evacuated during flood: age 0 to 5: ,age 6-17: , age 18 to 70: 2 ,age 70+:

Project Supporters

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BVN
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STUDIO NIELD

	Yes	No	N/A	?
3.0 Building Clean-out Status				
3.1 Is the building clean of mud, silt and water?	x			
If No: We recommend a full secondary clean of all mud, silt and water. Make sure to check on tops of the building frame if possible (beams, trusses, posts, etc.)				
3.2 Has the building finished drying out?		x		
See **Summary of Recommendations** at end of document - subheading "internal linings/external cladding"				
3.3 Have possessions, furnishings, linings, joinery, etc. been removed?	x			
If No: All affected materials need to be removed. This includes: all kitchen and bathroom cabinetry. All plasterboard. All carpets,vinyl,etc. Underneath all linings needs to be thoroughly cleaned and then dried. This is to decrease the chance of mould once linings have been removed.				
4.0 Asbestos and lead paint				
4.1 Is the house built prior to 1990? If yes, it may have asbestos.		x		
4.2 Are there any potential signs of asbestos? If evident, advise owner to seek appropriate advice.		x		
If Yes: If you suspect asbestos is present do not cut, sand or displace any material sheeting. Contact an asbestos expert. 1300 QH INFO.				
4.3 Is there potential encapsulated non-visible asbestos lining (eg. under floor tiles)?		x		
If Yes: If you suspect asbestos is present do not cut, sand or displace any material sheeting. Contact an asbestos expert 1300 QH INFO.				
4.4 Recommend testing for lead paint?		x		
If Yes: Be aware there health risks related with lead paint. Avoid sanding and wear protective clothing and masks during clean up. Seek further advice if need be.				
Note: A person removing > 10m2 of asbestos must have an 'A' or 'B' class WHS license				
5.0 Structure				
5.1 Has the water visibly shifted the house structure?		x		
If Yes: A structural engineer will determine the extent of structural damage and advise as to the necessary initial step of securing the structure. Do not proceed in any renovation work until the engineer has cleared the building.				
5.2 Has there been visible subsidence or cracking in the sub-structure?		x		
If Yes: A structural engineer will determine the extent of sub-structural damage and advise as to the necessary initial step of securing the structure. Do not proceed in any renovation work until the engineer has cleared the building.				
5.3 Have floodwaters scoured out soil around footings/foundations (remove silt to see)?		x		
If Yes: An engineer will advise as to the necessary steps to secure the foundations.				
5.4 Are there any cracked or broken structural members?		x		
If Yes: An engineer will advise as to the necessary steps to repair the affected structure.				
5.5 Are there any affected laminated beams, or other composite members in the structure?	x			
LVL lintel above sliding glass door to patio. We recommend structural engineer look at the LVL in one or two townhouses in the development and advise whether all the LVLs are ok (see summary of recommendations) - since all townhouses have the same lintel and were inundated for the same amount of time				
5.6 Are all flooring members adequately seated and beared? Including sub-structure?	x			
If No: An engineer will advise as to the necessary steps to secure floor framing				
5.7 Did water inundate areas of steel posts?		x		
If Yes: Posts may have filled with water from holes in the top. If necessary drill a very small hole at base of the post to allow water to escape.				
5.8 Did water inundate areas of steel framing?			x	
If Yes: Make sure that all steel is clean and dry from water and silt.				
5.9 Are there any structural brick walls affected?	x			
If Yes: Brick cavities and cores may have filled with water. If possible check if water has flowed into cavities through gaps in the top or vents in the side. Take note to advise future builder and engineer.				

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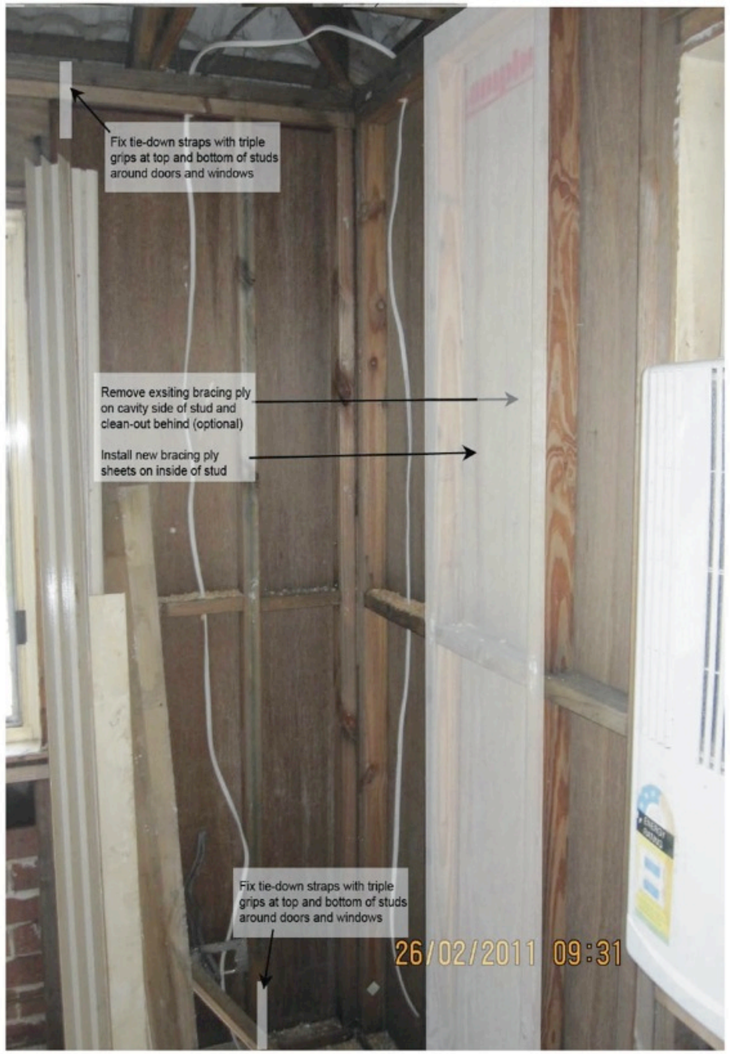

Recommendation: Bracing & Tie-down

Units at 5 Spalding Crescent – Summary of Recommendations:

Note – this section begins with a compiled summary of recommendations relevant to **all** the townhouses inspected at 5 Spalding Crescent. Notes of additional concerns specific to your unit (if any) are at the end.

Cleaning:
- Give the stripped-out interior a further clean: concentrating especially on the structural members above ceiling level. Use a cloth with water and some kind of disinfectant (e.g. chlorine)
- Treat with a mouldicide product afterwards.
- Clean out under and on top of the edge of the damp-proof coursing at the bottom of the exterior walls (see photo on page 8).

Additional (Optional) Suggestion:
- Remove soffits at eaves and clean out.

Structural:
- All home-owners in complex could get together and seek an engineer to inspect one of each type of townhouse (end, middle) for the same 3 issues: 1) checking the LVL lintel above the sliding glass door onto the back patio; 2) all bracing ply and tie-downs (or lack of); 3) any cracks in the concrete blockwork party walls between units.
- All bracing ply to be replaced (unless otherwise stated by engineer).Remove existing ply where possible and clean behind.

Potential Option for Replacement: fix metal straps with triple grips to the top and bottom of studs around doors and windows; AND fix new bracing ply sheets to studs on the interior face of stud wall where the existing bracing ply sits (see photo on page 9). Removal of existing ply sheets before doing so optional: preferable as it allows cleaning out of any muck behind. Consult engineer also.

Roof:
- On visual inspection from the ground, roof seems to be in a reasonable condition.
- Roof structure seems to be intact and has not shifted which is positive.
- Clear all gutters of mud and debris.
- Fix/replace all damaged downpipes. Reseal downpipes at the top where they meet the gutter.
- Replace roof insulation: Install batt insulation above ceiling. Run Sarking (foil lined waterproofing membrane) between trusses and drain to eaves where possible.
-Have roof inspected by licenced roofing contractor. Replace broken tiles/repoint where necessary

Additional (Optional) Suggestion:
In the cleaning section, we have recommended the removal of all eaves soffits for cleaning. When these are replaced/re-instated, place some perforated panels/grilles in the eaves to help ventilate the cavity and prevent growth of mould etc. Also,replacing some of the bricks in the external walls (non-structural) with air bricks will assist in ventilating the wall cavity. This will help prevent growth of mould etc in the cavity and help in preventing odours produced by any mud in the cavity.

Party wall (structural concrete block wall between units):
-Have any cracks in this wall checked by a structural engineer
- Party walls should be fireproof, but currently are not. Seal any penetrations in the wall (i.e. hole where a power socket to both units either side of the wall existed). One option is to fill the penetrations with a fire-retardant, expanding foam product. Another option, if the power points are to be kept, is to seek advice from a licensed electrician.
- Where it had been inundated by water, replace the layer of fire-insulation ('Firestop' or a similar product)located where the party wall meets the roof

ARUP

EAA Structural Assessment Checklist

emergency architects australia

Date of Visit: 0 4 | 0 3 | 2011 (Day/Month/Year)

EAA Building Assessment 2011 Job No. 0093

Building address:

No..80.....Pegg Road.....

Suburb.....Rocklea.....State.....QLD.....Post Code.....4106.....

	Y	N	N/A	Notes
Check details of house construction as noted in architects inspection form. *Attach to this checklist*	x			
Before entering property, check that power is off, or property has been signed off as safe by qualified electrician.	x			
Before entering property, check whether property has been determined to be asbestos-free. *If not, proceed only in accordance with Arup SWMS if certain that any asbestos is bound and undisturbed.*	x			**Potential Asbestos observed along the eaves lining at the rear of the property**
Before entering property, ensure that appropriate clothing and PPE worn *e.g. boots, gloves, eyewear, hardhat, protective clothing, sunscreen*	x			
Record the extent to which structure is visible and accessible **House has been largely cleaned. Only the main interior wall sheeting has been stripped. Kitchen carpentry still remains and is not in a state to be reused.**				
<u>View each elevation of the house.</u> Is there any perceptible out of plumb or square in any posts, walls or door or window openings?		x		
Is there any visible cracking or opening up of joints? Is there any perceptible bulging of walls?	x			**Horizontal cracking observed on the exterior brick wall on the front face of the residence.**
If so, look for evidence to try to determine if misalignment is due to flood affects (recent subsidence, scour or lateral water loading) Notes: **Levelling of the house with additional timber packers suggests that the property has had previous history with settlement issues. Increased water content to the soil beneath the property could have caused increased subsidence to the foundations of the brick work wall resulting in the cracks observed on the brick work.**				
<u>View inside house</u> Are there any out of plumb or square posts, walls, doors or window openings?		x		
Are there any significant out of level floors?	x			**The brick work flooring to the south western side of the property appears to have subsided.**
Is there any visible cracking or opening up of joints?	x			**Vertical and horizontal cracks are observed in the south and north western corners of the brick flooring area.** **To the rear of the property, owner has recently put in a new extension to the property. The connection detail between the timber bearings and the fascia of the main property is not good practice and should be rectified.**
If found try to determine source – deflection of floor or roof beams, timber decay, **<u>foundation movement</u>** etc. Notes: **The source of brick work cracking and floor subsidence is likely to be as a result of foundation movement beneath the brick work due to increase settlement in the soil from the floods. The reason why defects are observed only within the western section of the property is because the brick work only provides a support base to the western section of the property, which is separate to the support base to the rest of the property. The rest of the property is predominantly supported by adjustable steel stumps and any settlement issues can be counteracted by adjusting the steel level to suit.**	x			
Look for wall bracing (ply, hardboard or diagonal braces) Are there any signs of racking or damage? Notes: **Ply appears to be in good condition**.....		x		
<u>View outside house</u> Are there any signs of damage or misalignment of foundations stumps, post bases, floor slabs?	x			**Brick work has evidently subsided in the south western corner of the property.**
Are there any signs of damage or misalignment of foundations for the external stairs?		x		
Look for tie downs Is there any presence of water pressure lifting house off foundations or laterally displacing house relative to foundation location?	x			
What is the condition of the tie downs?				**Ok**
For masonry walls, are there any cracks apparent? • Crack widths? • Retaining Wall • **Caused by brick or growth/foundation movement?**	x			**0.5mm cracks observed in brick work.**

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Hmmm... traditions developed here in Queensland versus those which evolved elsewhere.

I know which I prefer...

ORIGINAL HOUSE

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RENOVATED HOUSE

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Reactionary planning exacerbates the personal and financial burden already faced by disaster-affected home-owners, while designed resilience assists in mitigating these impacts.

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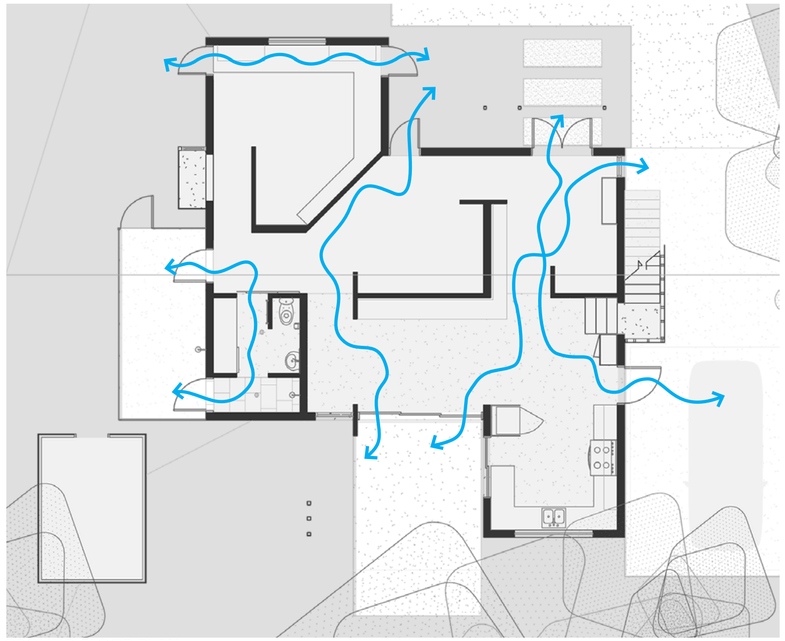

GROUND FLOOR PLAN

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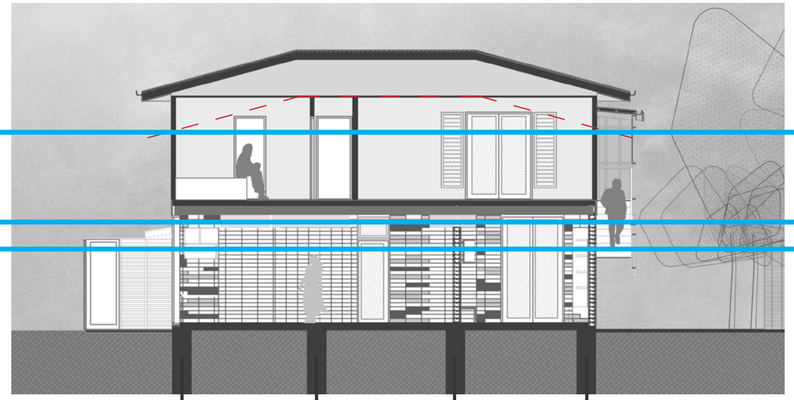

SECTION

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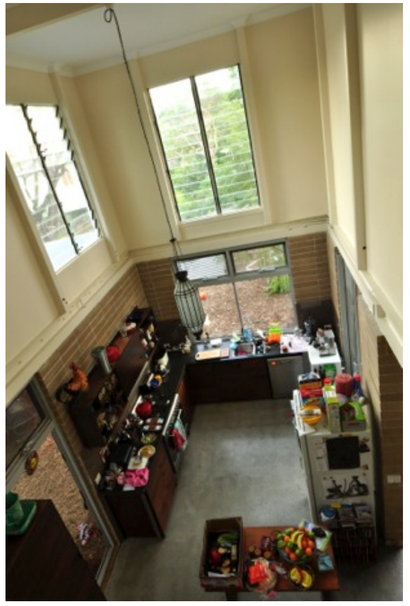

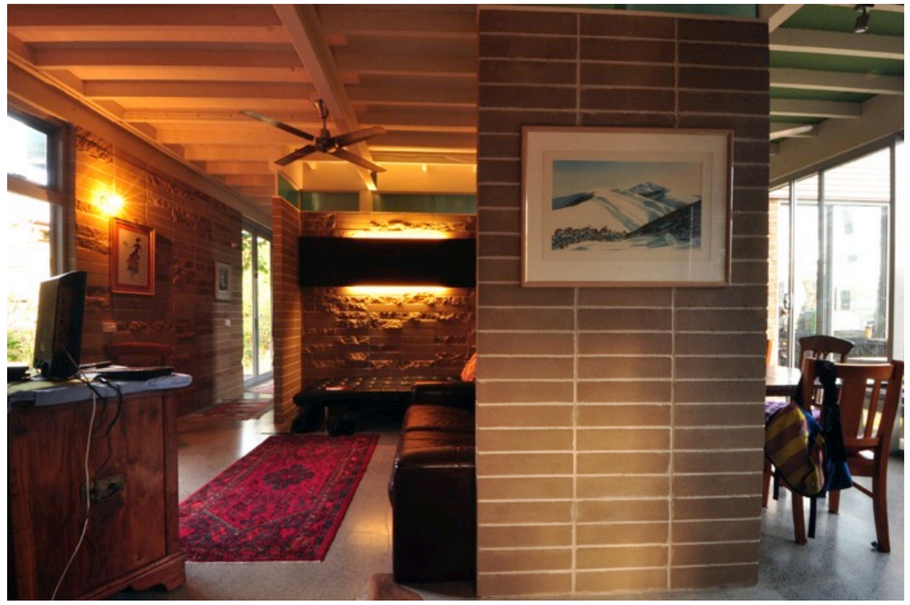

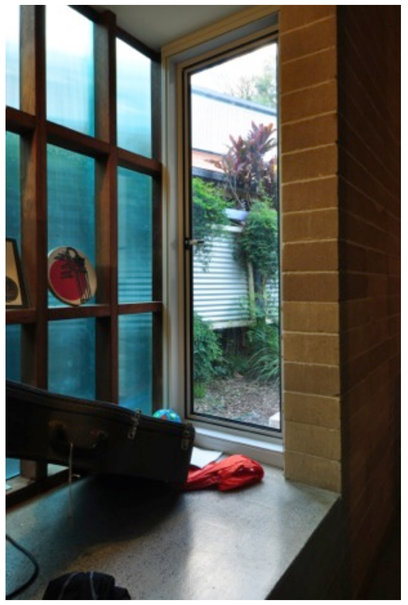

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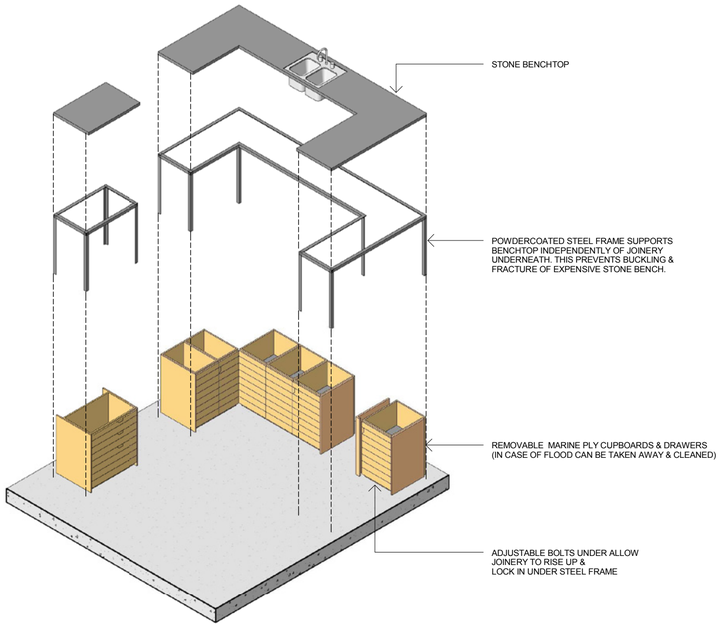

KITCHEN DETAIL

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COMPLETED KITCHEN

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Designing for resilience should assist in lowering insurance premiums.
The problem will be getting insurance companies to accept this as a logical idea.
I'm not holding my breath...

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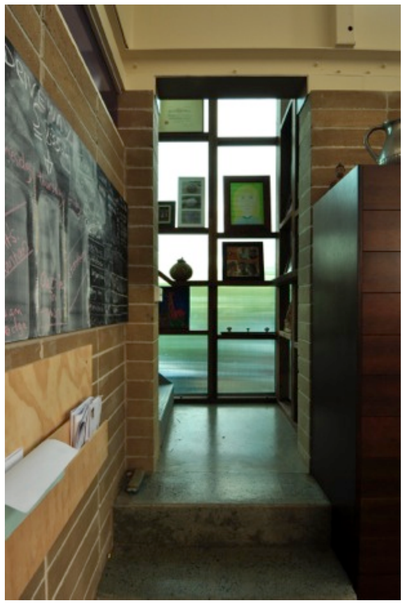

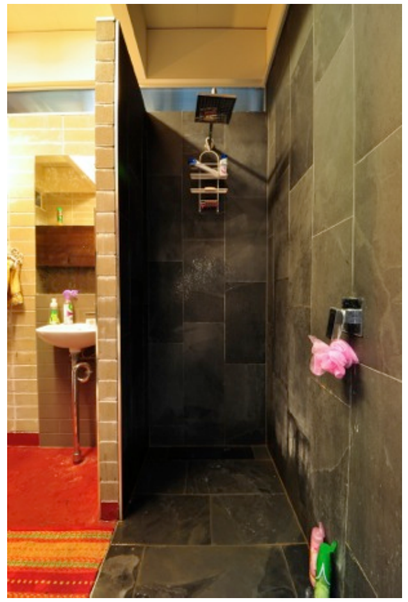

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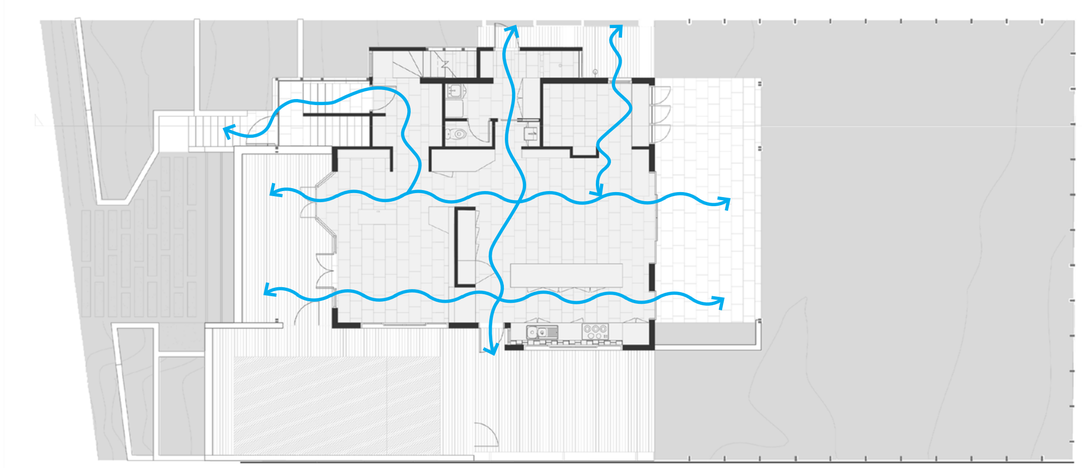

FIRST FLOOR PLAN
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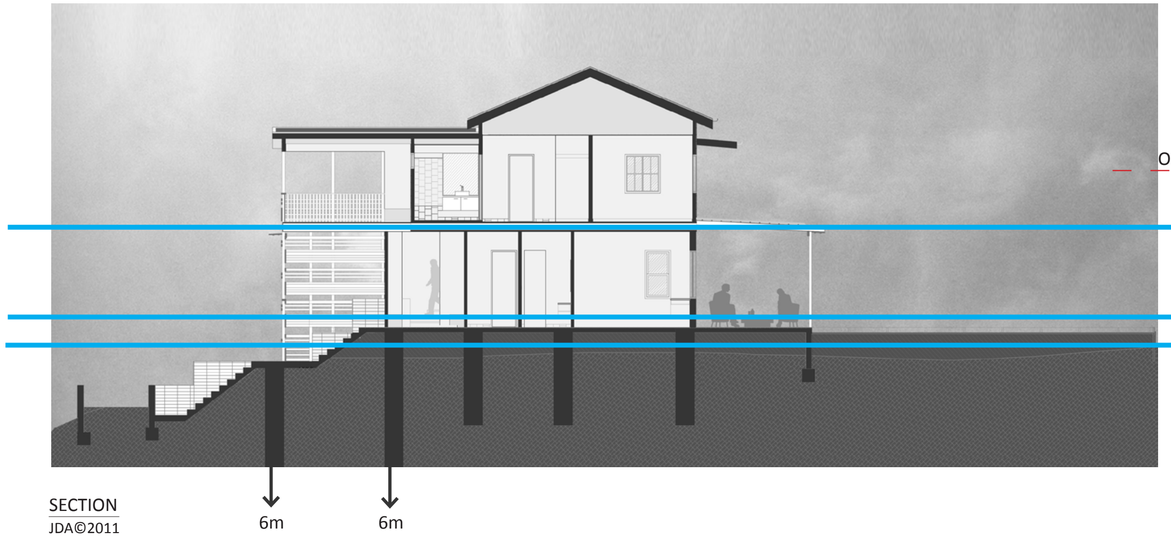

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SCALE? What scale? Streetscape anyone?

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BEFORE RAISE
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AFTER RAISE
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Knee-jerk reactions by planning authorities in the wake of the 2011 floods imposed restrictive and prohibitive guidelines for post disaster reconstruction and recovery which will have long-term financial consequences on those who can least afford it – the victims of disaster.

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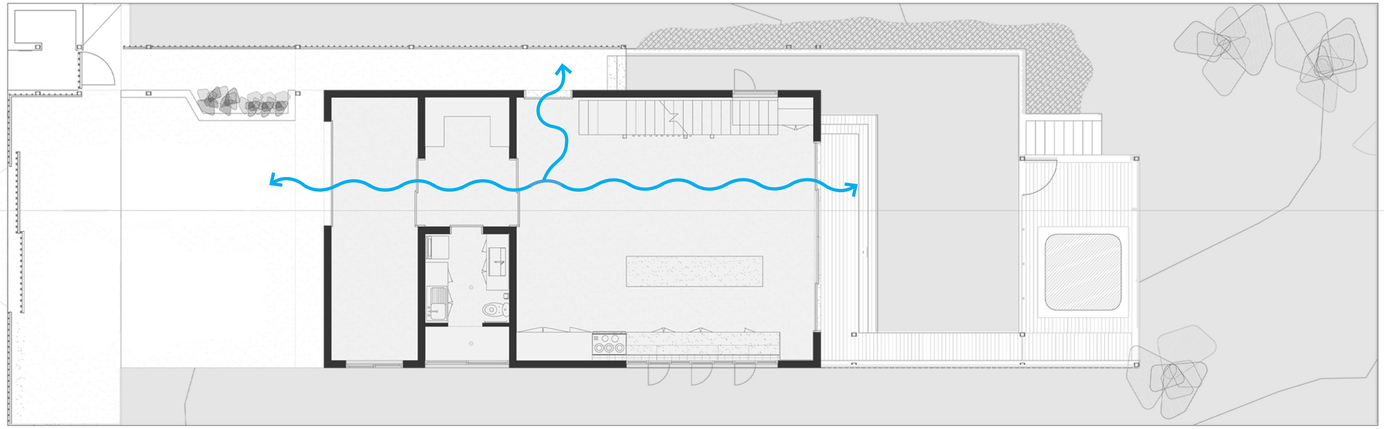

GROUND FLOOR PLAN

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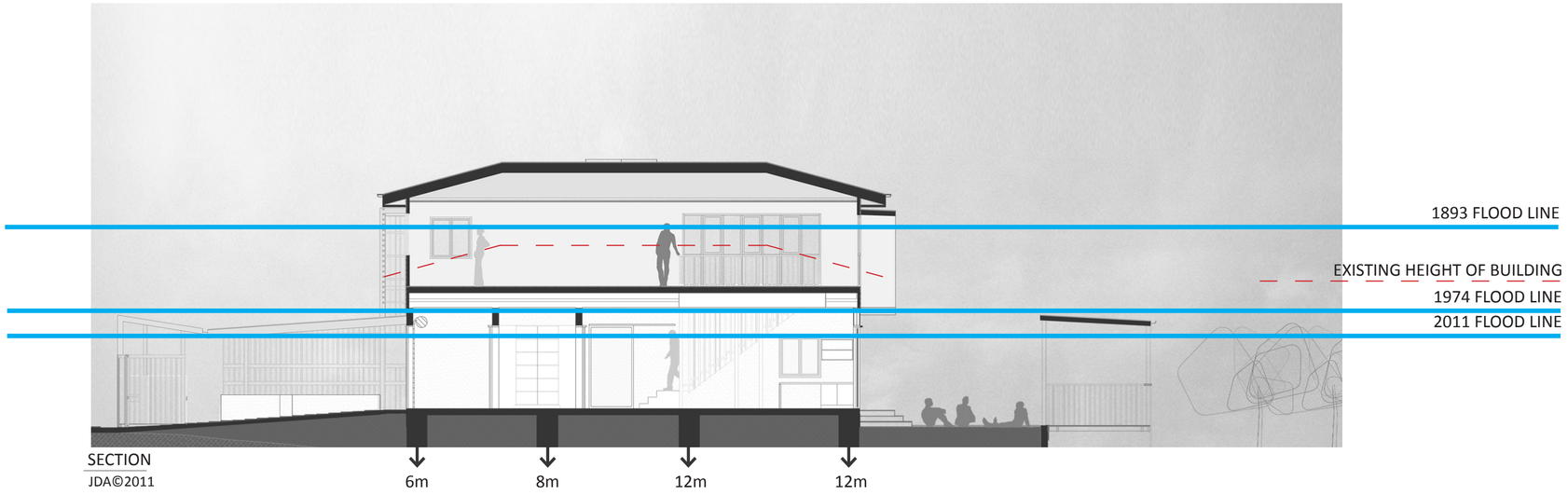

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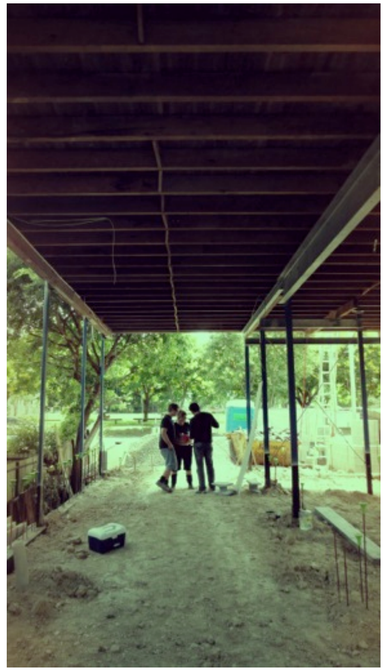

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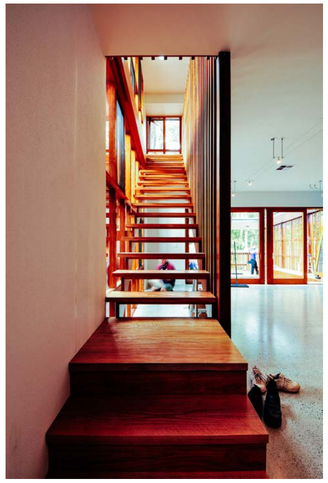

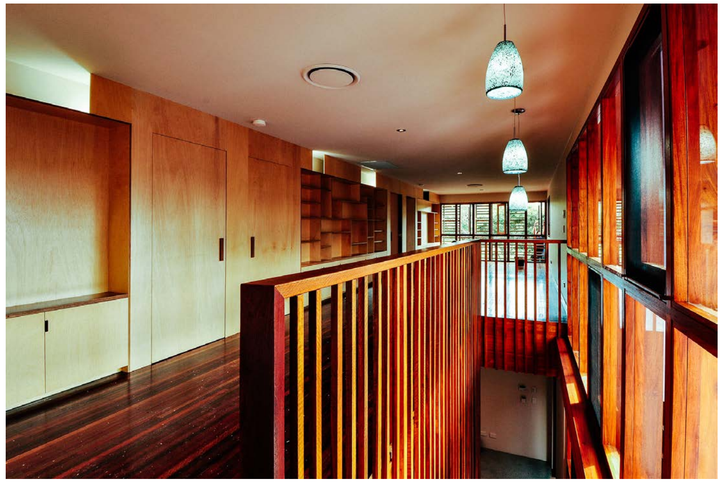

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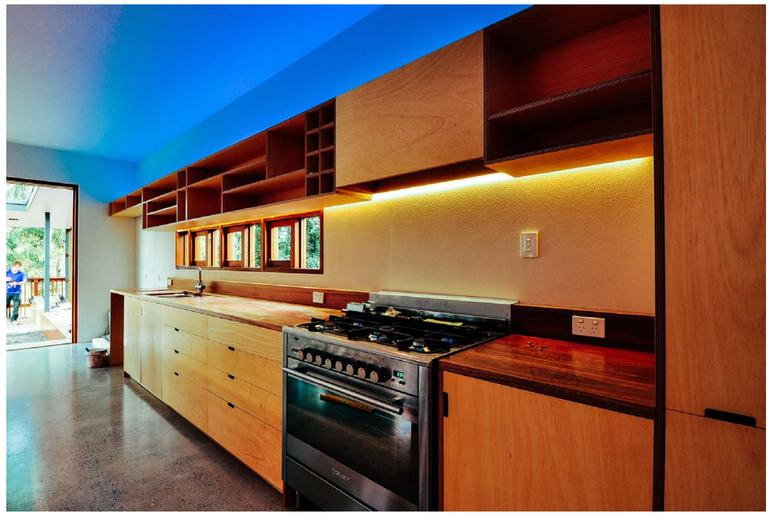
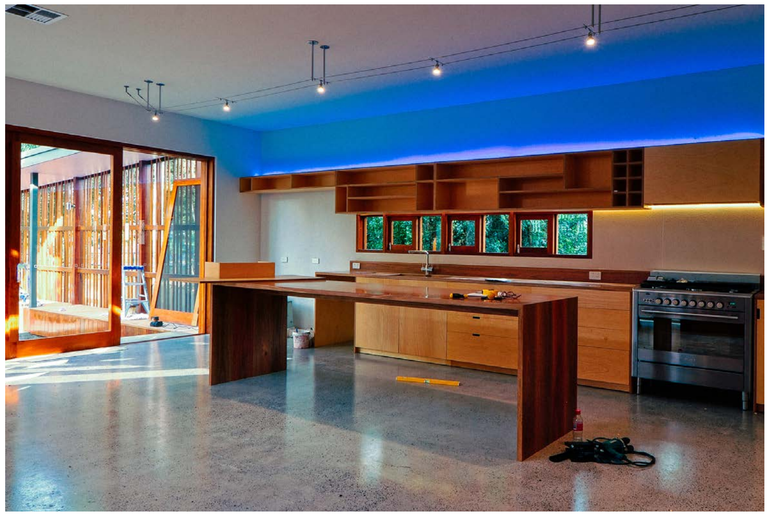
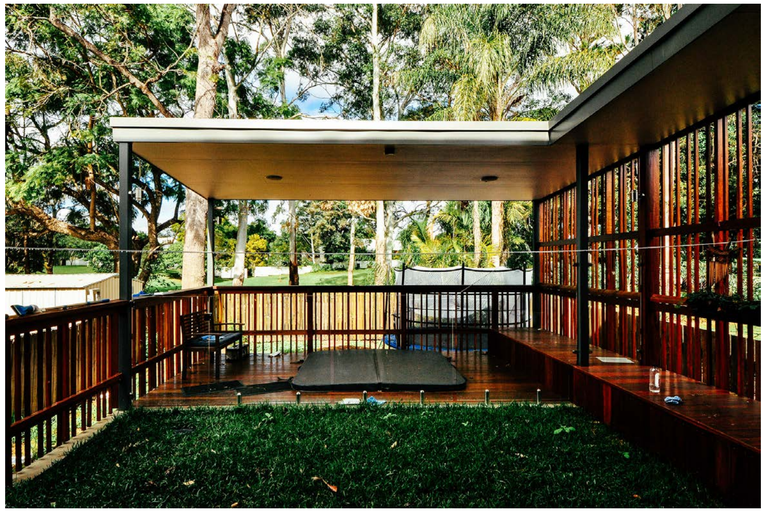






Often the requirements of the TLPIs were irrational and resulted in unecessary additional costs being passed on to homeowners already suffering undue stress; eg. the exuberant raising of existing buildings above arbitrary flood levels.

Brisbane City Council

FloodWise Property Report

Report Reference
1500171
15/02/2011 13:08:14

Dedicated to a better Brisbane

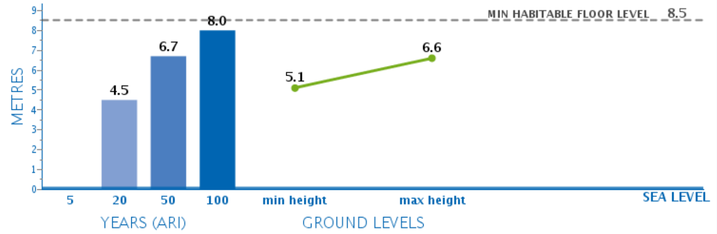
The FloodWise Property Report is a free report to inform Brisbane residents and professionals about flood risks for a specified lot or property so they may better prepare for flooding and to plan and build in accordance with Council requirements.

To find out more about how the contents of this report may affect your ability to build or renovate, as well as Council advice on how to protect your property and family by being FloodWise, visit www.brisbane.qld.gov.au, a Customer Service Centre or call (07) 3403 8888.

PROPERTY DETAILS:

Address: 203 GRACEVILLE AVE GRACEVILLE QLD 4075
Lot Details: L.106/RP.29418

FLOOD LEVEL INFORMATION



Flood Levels
The blue bars in the graph above show the height of flooding estimated to occur on average once every 5, 20, 50 and 100 years at this address or lot.

Ground Levels (Min - Max)
The line above shows this property's lowest and highest ground levels. Confirm with a surveyor.

Minimum Habitable Floor Level
The dotted line in the graph above depicts the minimum height above sea level that habitable areas of development must be constructed to, i.e. lounge, kitchen or bedroom.

For a detailed summary of anticipated flood levels and flags see technical summary over page.

HIGHEST SOURCE OF FLOODING

RIVER The highest source of flooding affecting this property originates from a river. For more information about flooding in your area you can view and download Council's Flood Flag Maps by visiting www.brisbane.qld.gov.au/floodmap

Reactionary Reponses – Local Government Temporary Local Planning Instruments

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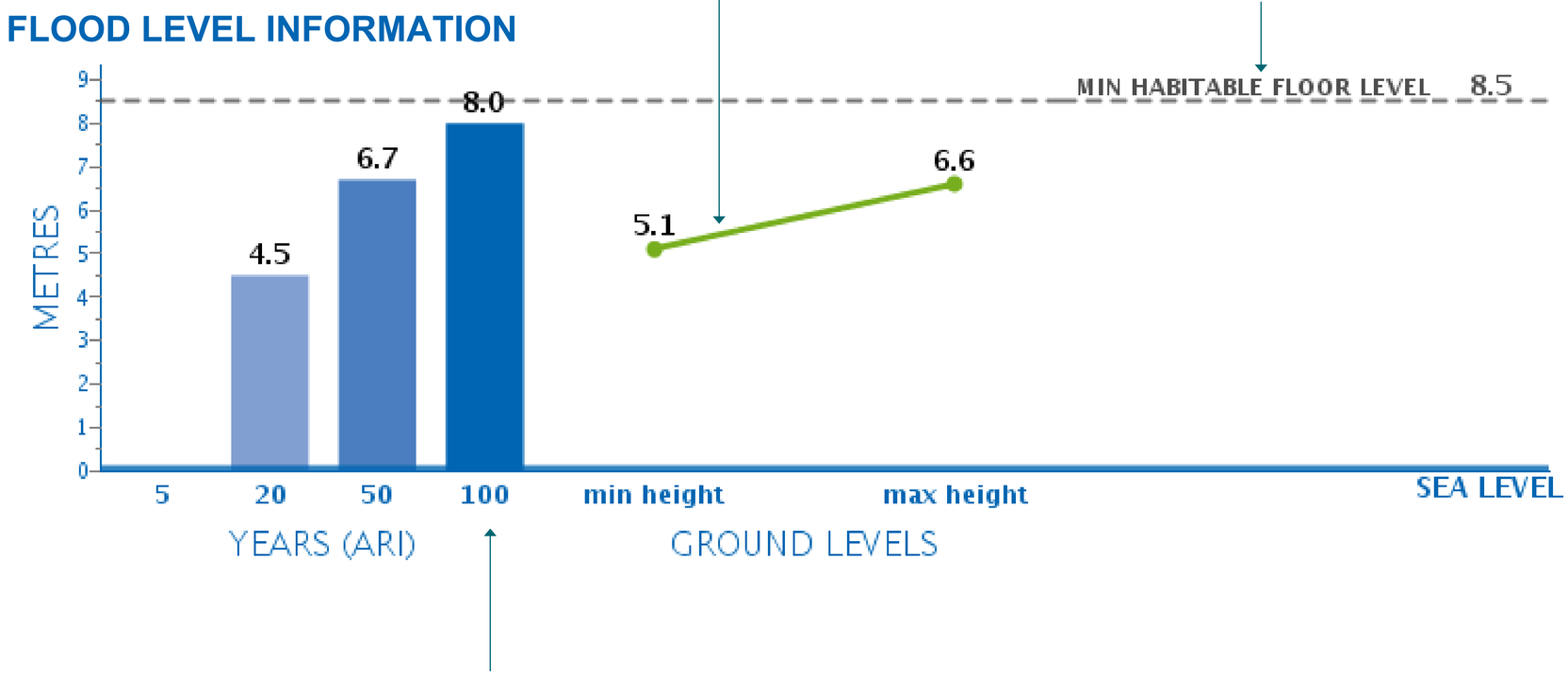
Ground levels on site

Prescribed flood datum by Council



Q100 line, which indicates a 1in100 chance of annual flooding

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Graceville Ave – 2011 inundation levels including neighbouring houses

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Post-flood Local Government established datums for minimum habitable floor levels

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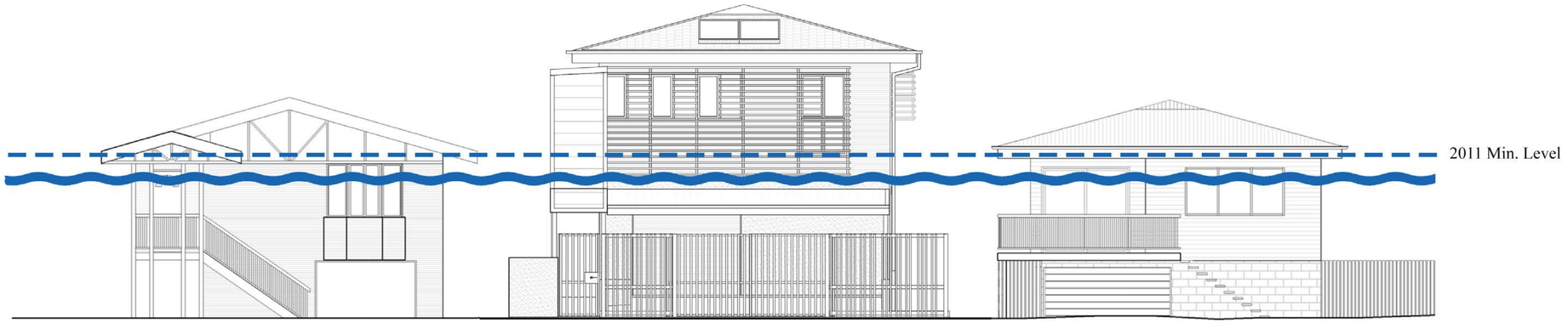

Elevation as protection against inundation - Graceville Avenue case study after raise

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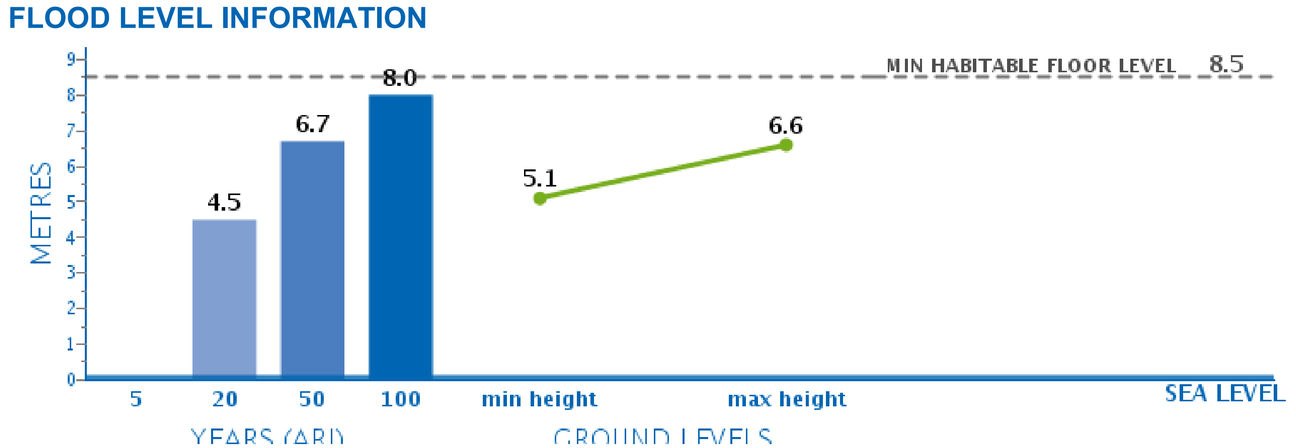
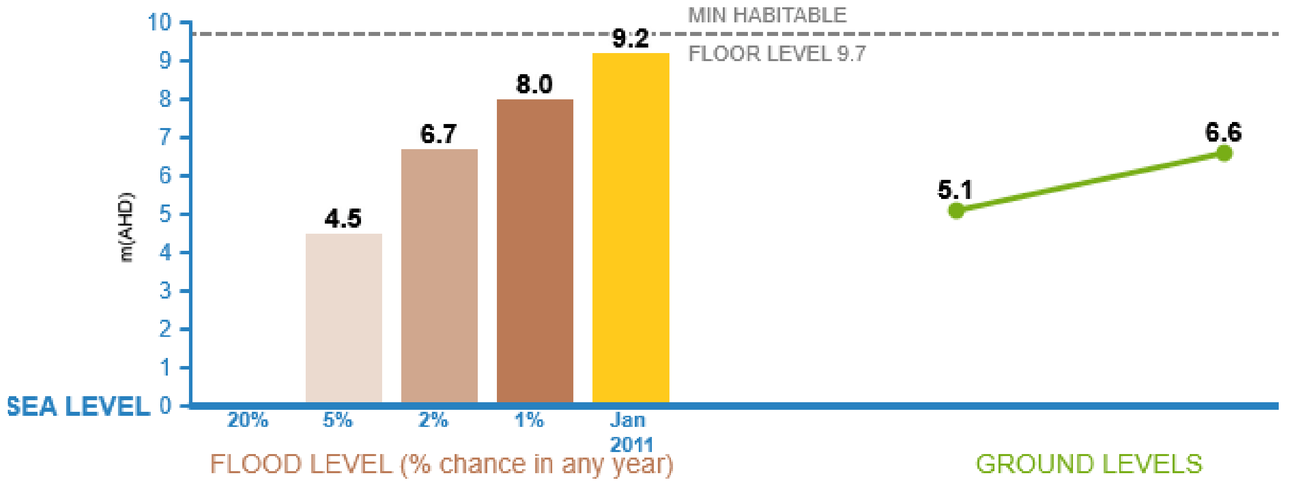
2011



2015



Reactionary Planning at its finest – Shifting Datum Levels
What are home owners to do? COSTS vs BENEFITS

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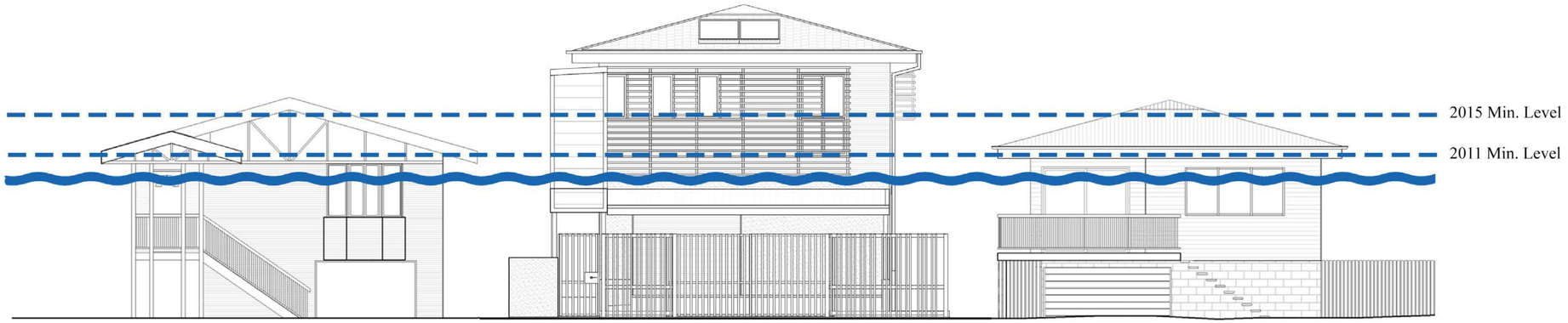

Shifting datum levels - what was the point of the line in the first place?

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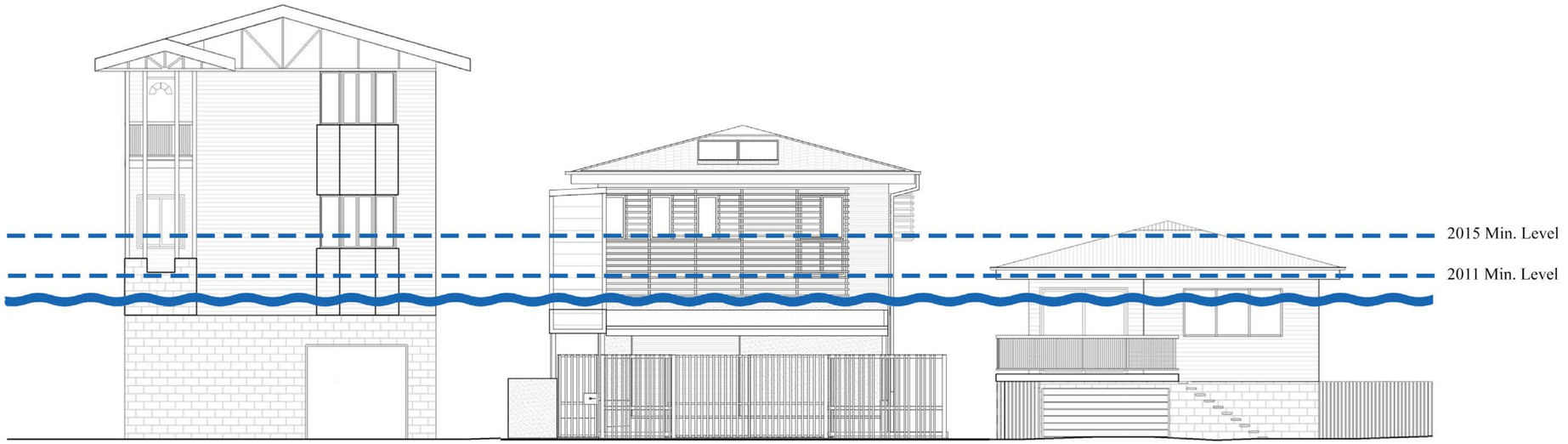

How high do we go???
What was the point of the line in the first place?

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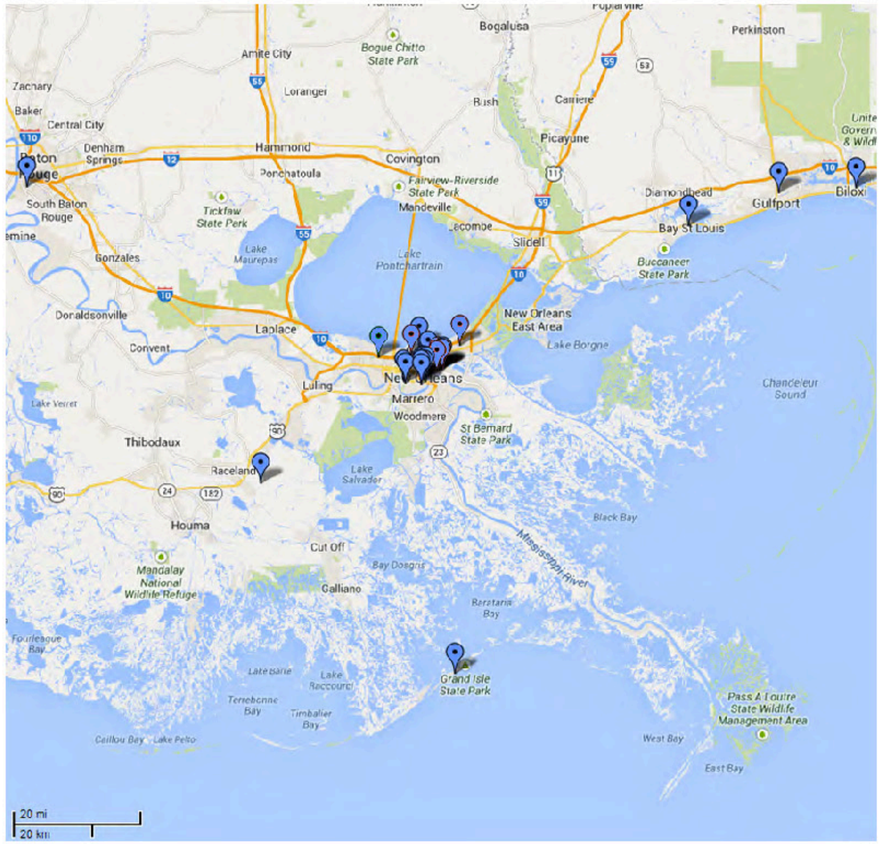

New Orleans & The Gulf Coast

17 June to 3 July 2013

New Orleans, LA:

Case Studies
Alvar St Public Library
Biloxi Affordable Houses
Doullut Steam Boat Houses
Dwyer Canal
Lakeview Mansions
Habitat for Humanity Musician's Village
Make it Right Houses

American Institute of Architects (NOLA)
Brett Petry, President

Habitat for Humanity (NOLA)
Jim Pate, Executive Director

New Orleans Redevelopment Authority
Jeffrey P. Hebert, Executive Director

Make it Right: Lower 9th Ward
Tom Darden

Spackman Mossop & Michaels
Elizabeth Mossop, Director

Tulane University School of Architecture
Professor John Klingman
Dr. Carol McMichael Reese
Byron Mouton

Wagonner and Ball Architects
David Wagonner, Director

Lafourche, LA:

South Lafourche Levee District
Windell Curole

Grand Isle, LA:
Grand Isle Houses

Bay St Louis, MS:

Unabridged Architecture
John and Allison Anderson

Biloxi MS:

Gulf Coast Community Design Studio
David Perkes, Director

Habitat for Humanity (Mississippi)
Barbara Levin, COO

Hope Community Development Agency
William F Stallworth, COO

Baton Rouge, LA:

Lousiana State University Ag Center
Patricia Skinner, Instructor

LSU Coastal Sustainability Studio
Patrick Michaels

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The Netherlands

16 September to 24 September 2013

The Hague:
Factor Architecten
Mattijs Loor
Deltacommissaris (Delta Commission)
Jos van Alphen
Netherlands Water Partnership
Lennart Silvis, Director

Delft:
Delft Flood Risk Center
Bertien Broekhans
Deltares
Herman van der Most
TU Delft, UNESCO IHE
Kin Anema
Chris Zevenbergen
Richard Ashley

Amsterdam:
Case Study: IJburg Floating Houses
Studio Herman Hertzberger
Herman Hertzberger, Director

Middelburg:
Bosch Slabbers Landscape Architects
Steven Slabbers, Director

Rotterdam:
Case Study: Water Square Benthemplein
De Urbanisten
Dirk van Peijpe
Rotterdam Public Works
Peter van Veelen
Royal Haskoning
Mathijs van Ledden

Maasbommel:
Case Study: Dura Vermeer Floating Houses

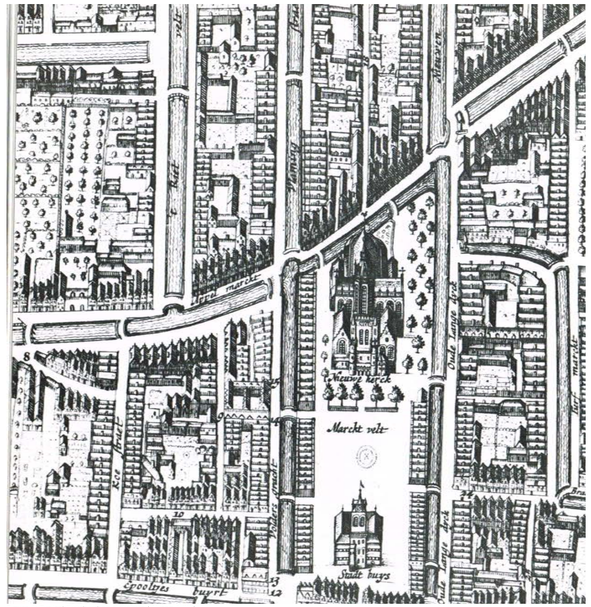

Figure 1: Typical Dutch urban structure (Wyson 1986)

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architectuurstudio
architects and
urban designers


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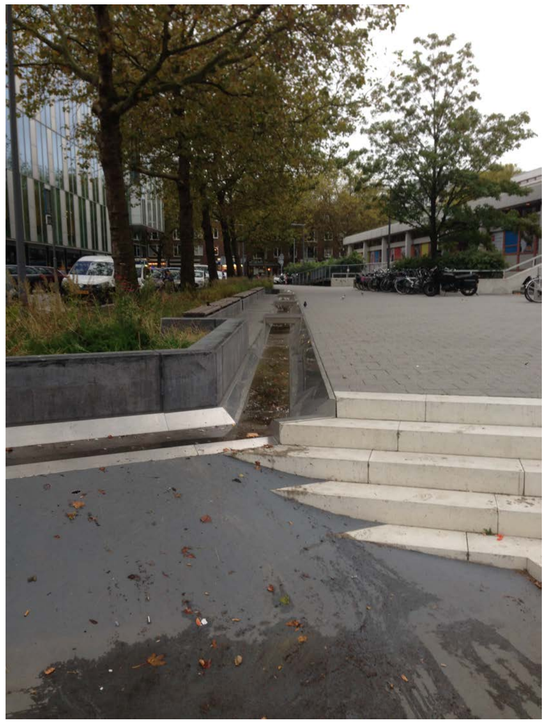

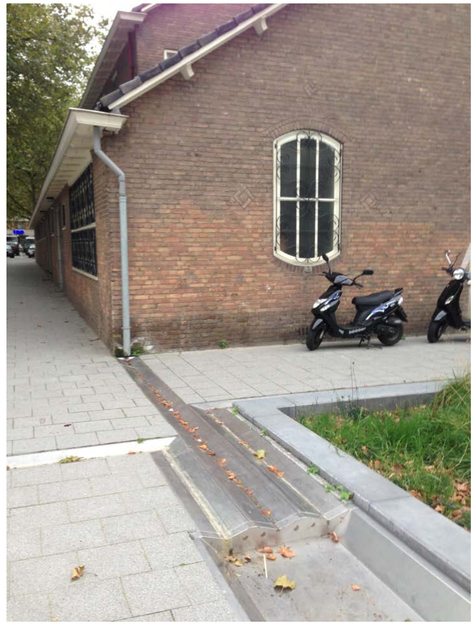

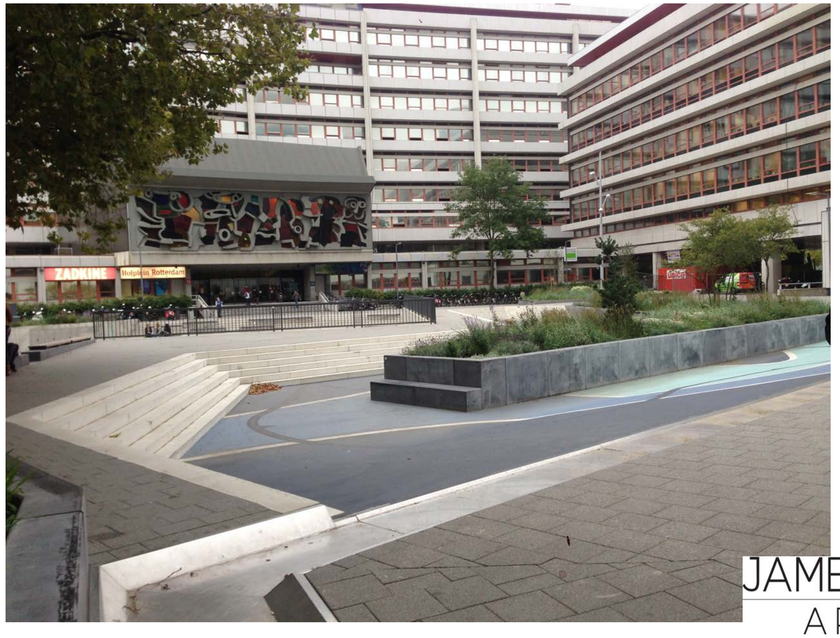

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Delta City Rotterdam

RNW Conceptdesign - May 21, 2013

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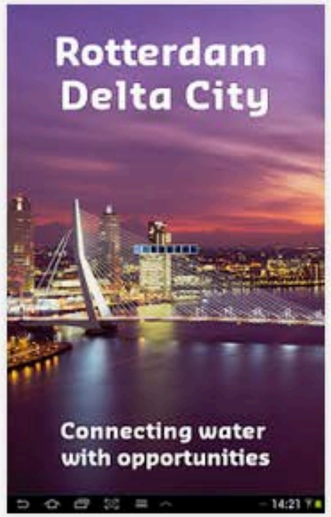

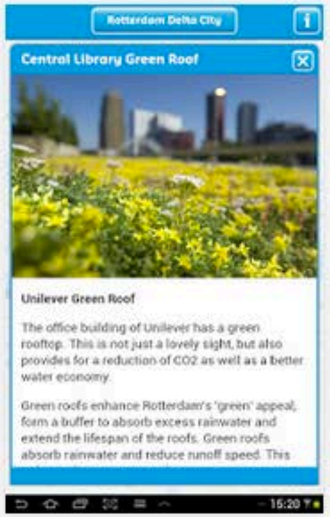

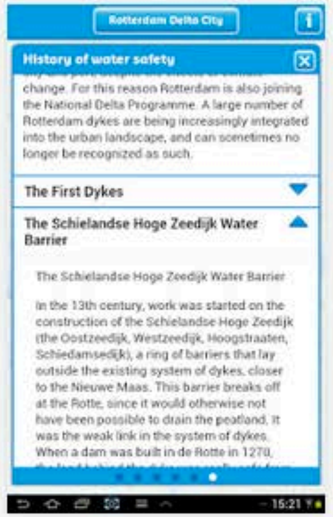

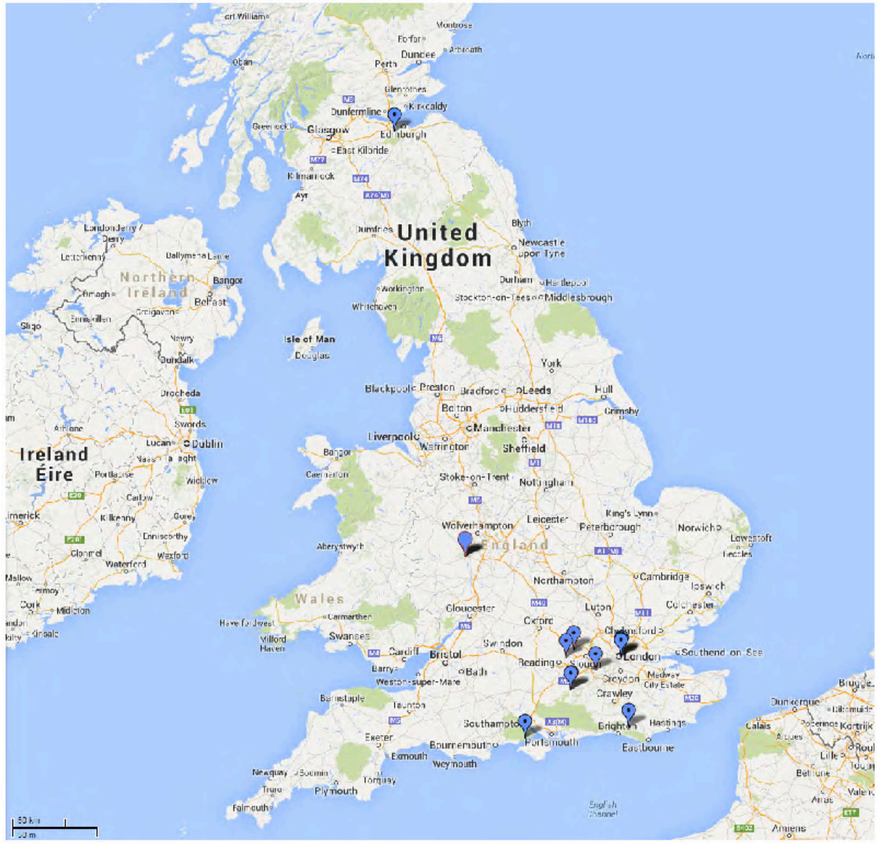

The United Kingdom

25 September to 10 October 2013

Edinburgh:
Heriot Watt University
Prof. Sue Roaf
Dr. David Kelly
Crichton & Associates
David Crichton

Glasgow:
British Research Establishment
Dr. Stephen Garvin

Bewdley:
Case Studies:
Flood Resilient Townhouses
Riverine Flood Protection System
National Flood Forum
Paul Cobbling

Lewes:
Case Studies
Linklater Pavillion
John Harvey Tavern
Riverine Flood Protection System

Surrey:
National Flood School
Chris Netherton, CEO

Hampshire:
John Pardey Architects
John Pardey, Director

London:
BaCA Architects
Robert Barker, Director
Flood Risk Management Authority
Robbie Craig

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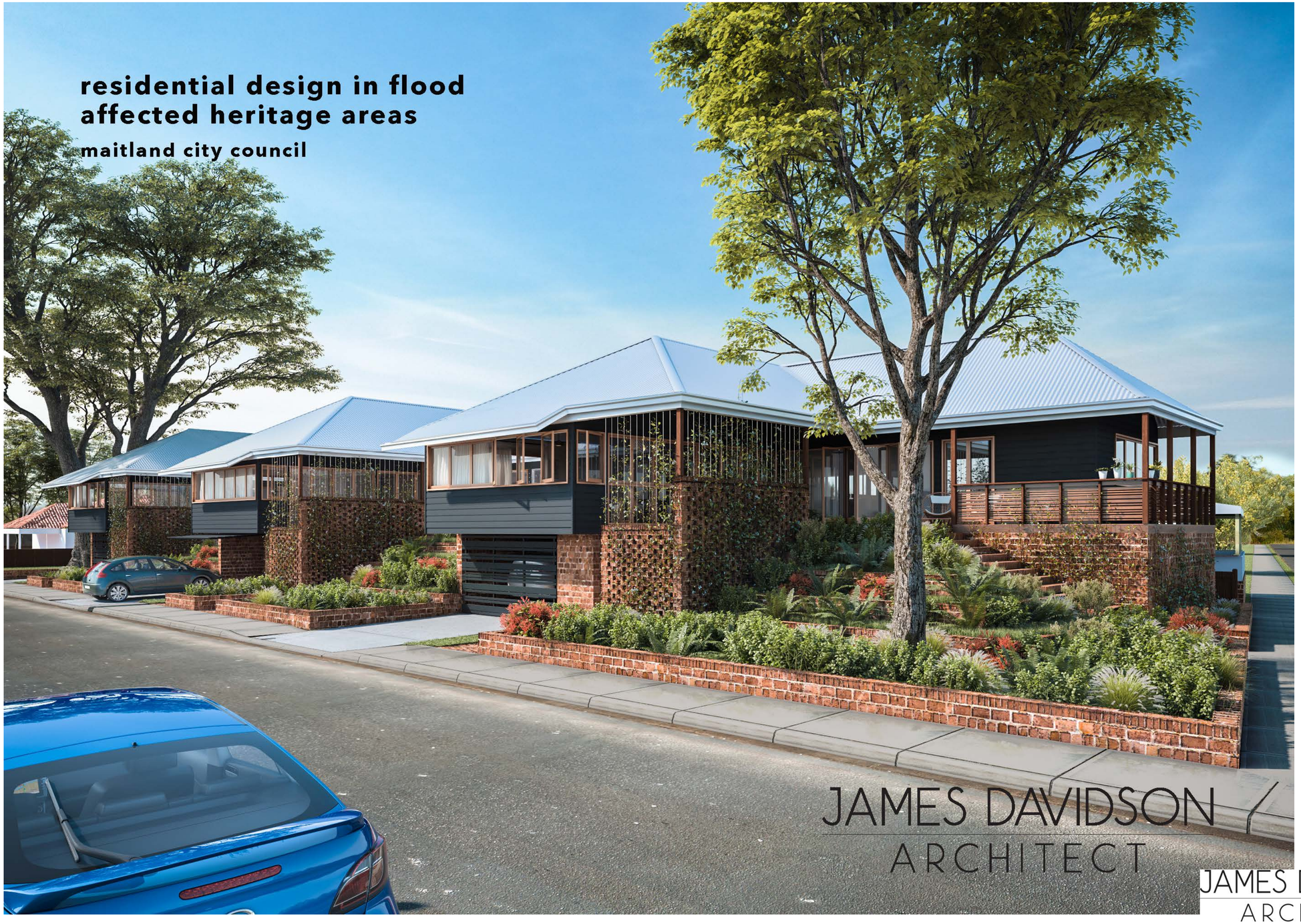

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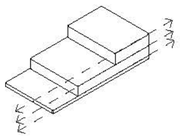
Heritage & Flood Synthesis

Character

Plinths



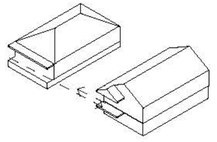
Plinths created in landscape, including for building footprints.

There is a presence of layers of plinths which provide a level of flood protection using the ground, while addressing issues of scale using landscape, rather than just building elements.

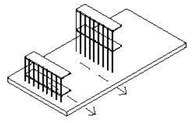
Solid elements can create layers of plinths which provide a level of flood protection using the ground, while addressing issues of scale using landscape, rather than just building elements.

Scale

Verandahs

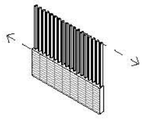


Solid layers correspond to verandahs and other ground plinths.



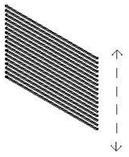
Verandahs create screening thresholds which break up scale.

Layering

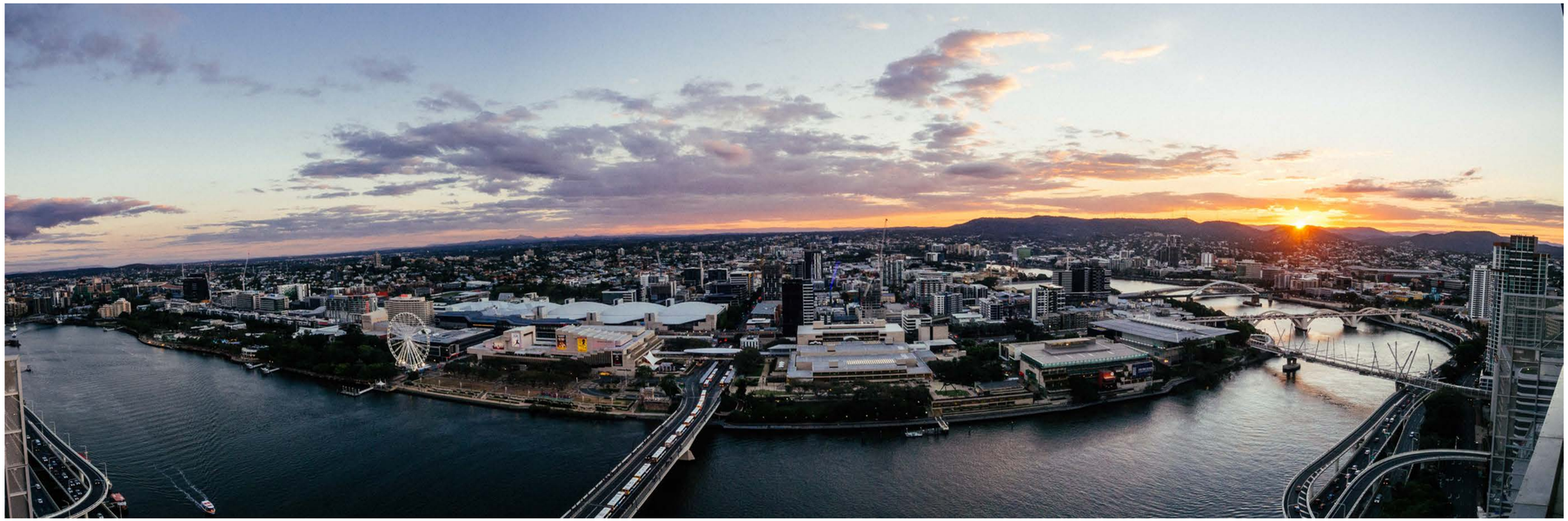


Screens can be combined with solid elements to break up tall facades.

Horizontal Elements



Horizontal elements address issues of scale.



SEQ Water Futures Design Charrette

JAMES DAVIDSON
ARCHITECT

PIB

Rijksdienst voor Ondernemend Nederland

JAMES DAVIDSON
ARCHITECT

Deltares

Enabling Delta Life

school of architecture

CRC for
Water Sensitive Cities

SOUTH EAST QUEENSLAND WATERFUTURES CHARRETTE

5 DAYS, 1 FIELD TRIP, 2 STAKEHOLDER ENGAGEMENTS, 3 WORKSHOPS TOWARDS SOUTH EAST QUEENSLAND AS A NEW WORLD WATER REGION

JAMES DAVIDSON ARCHITECT

PRINCIPLES

- DRAWING AS ESPERANTO BETWEEN DISCIPLINES
- SPATIAL DESIGN SEDUCES
- DESIGN VISUALISES UNEXPECTED OPPORTUNITIES
- INVESTMENT FOLLOWS INSPIRATION

REFRAMING THE QUESTION

DESIGN DRIVEN SCENARIOS
USING HISTORIC FLOOD LEVELS, AND WORST-CASE EXTREMES (2011 +30%), PARTICIPANTS WERE ABLE TO COLLABORATE QUANTITATIVELY AND QUALITATIVELY TO EACH SCENARIO

WATER AS BRISBANE'S NEW WORLD IDENTITY
WE CAN BUILD ON THE NEW WORLD CITY AMBITIONS OF BRISBANE AND REFRAME THAT VISION TO WATER AS THE CENTRAL FOCUS

WATER AS AN INTEGRATIVE ELEMENT
WE LIVE IN A REGION WHERE OUR LIFE IS DEFINED BY WATER, MAY IT BE THROUGH DROUGHT, FLOOD OR RAIN. WITH THAT IN MIND, OUR RELATIONSHIP TO WATER IS SOMETHING THAT UNITES US IN OUR REGION

COLLABORATION THROUGH DESIGN

3 OVERSEAS FACILITATORS
FROM THE USA & THE NETHERLANDS

171 PROFESSIONALS
FROM GOVERNMENT, ACADEMIA & PRIVATE SECTOR

23 STUDENTS
FROM THE UNIVERSITY OF QUEENSLAND MASTER OF ARCHITECTURE PROGRAMME

20 DISCIPLINES
INCLUDING: PLANNERS, DESIGNERS, ENGINEERS, POLICY MAKERS, HYDROLOGISTS, ECONOMISTS AND SOCIAL SCIENTISTS

A NEW WORLD WATER REGION

INTEGRATED REGIONAL CATCHMENTS
AN UPPER CATCHMENT, RIVER, BAY & COASTAL PLAN

PROTECT & REDUCE RISK TO CRITICAL INFRASTRUCTURE AND INVESTMENTS
CORE URBAN AREAS, PORTS & AIRPORTS

UTILISE A NATURAL SYSTEMS APPROACH
WHEREVER POSSIBLE, TO RESPOND TO DIFFERENT URBAN FORMS & LANDSCAPE TYPES

EMBRACE UNCERTAINTY
WITH A RISK BASED APPROACH TO DEVELOPMENT & SAFETY

MULTI-SCALAR FLUVIAL ZONE STRATEGIES
BUILDING, SITE, NEIGHBOURHOOD, TOWN, CITY & LANDSCAPE SCALE STRATEGIES WITHIN EACH FLUVIAL TRANSECT ZONE

CONVENER

JAMES DAVIDSON ARCHITECT

Dr. James Davidson, Project Director
Samuel Bowstead, Project Manager

DESIGN TEAM

Prof. John Hoal, Director HS Studio,
Chair of Urban Design at Sam Fox School at Washington University in St Louis, USA
Assistant Prof. Derek Hoeferlin, Director Derek Hoeferlin Design,
Faculty at Sam Fox School at Washington University in St Louis, USA
Tijs van Loon, Bosch Slabbers Landscape Architects, The Netherlands
Dr. James Davidson
Samuel Bowstead

FACILITATOR

Dr. Piet Filet, Convener of Flood Community of Practice

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PARTICIPANTS

JAMES DAVIDSON ARCHITECT

JAMES DAVIDSON
ARCHITECT

WATER BRINGS LIFE

What you are about to read is the culmination of over 5 years of work by many people, all experts in their own right, from many disciplines, professions and walks of life. Hundreds of hours of collaborative efforts have gone into the making of this book. Everyone involved worked from the same premise:

If South-east Queensland (SEQ) is to flourish in the midst of severe weather events and an increasing population, the region as a whole needs an integrated approach to water management. An approach built on principles of adaptability to protect us during periods of drought and flooding rains. A strategy that combines the best of our extensive local knowledge with experts of international standing to bring communities, Local, State and Federal Government together to create a vision for our water future.

What we present here are the beginnings of this vision. Through the medium of design, we propose a range of water management and urban design solutions and strategies. These will not only protect us in times of need and build community resilience, but also enable us to reduce our ecological impact and improve our quality of life in the face of more frequent and extreme weather events. Water is the key to this; retaining water during drought and allowing it to either flow or slowing it down during floods.

In building on the individual works and ideas of experts in the field of water management and urban design, the authors of this book were funded to facilitate a five day design Charrette (workshop). The Charrette saw over 170 professionals from over 20 disciplines come together with Local and State Government to work towards a regional water management plan. This book is the result of that intensive design-focused interaction and collaboration.

So what did we learn?

First, that the communities in the Brisbane, Bremer and Lockyer Creek Catchments are all interconnected and need to work together to protect themselves against the impacts of drought and flood. From the cliffs of the Scenic Rim in the west to the barrier islands of Moreton Bay in the east, Southeast Queensland is an ecological system where the actions in one area affect another and therefore the whole catchment.

Each smaller catchment influences, and is an influencer, of the other. For example, flooding rains in the Lockyer Valley not only result in the inundation of Ipswich and Brisbane, but significant sediment flows into the Brisbane River. This not only affects the quality of our drinking water, but can also cause over-sedimentation of Moreton Bay which affects sea grasses, fish stock and our eventually our region's economy.

We call this the Fluvial Transect - a concept that allows us to view water in different geographical areas of southeast Queensland. Representing an interconnected series of waterways and catchments and building on the physical qualities and ambitions of interconnected communities across the Brisbane River Catchment, the Fluvial Transect sees water as a liveability asset, increasing resilience and decreasing risk.

The principles developed as part of this work are also relevant for flood-affected communities in other parts of Queensland and Australia more broadly.

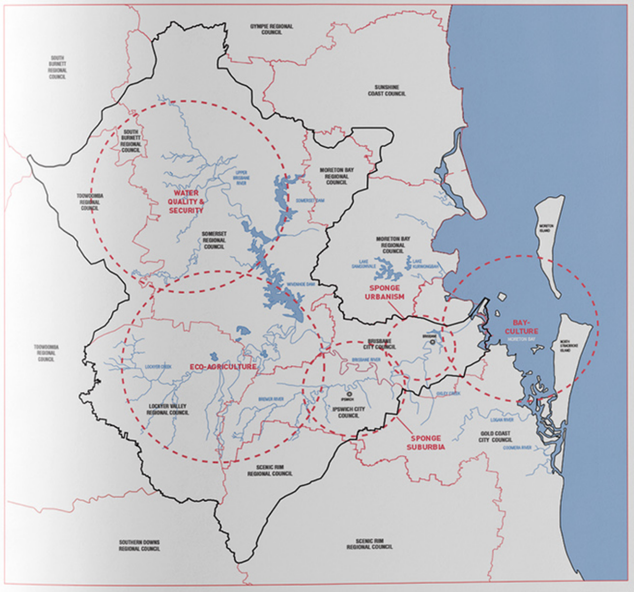
Fluvial
adjective
1. of or found in a river

Transect
verb
1. (transitive) to cut or divide cross-ways

We can't control severe weather events, however, through lived experience, we can learn to change, adapt and design.

We need an integrated approach to water management that considers the complexities involved in adapting the built and natural environments to such extremes.

We need a clear, shared vision.



The Brisbane River Catchment region of Southeast Queensland is comprised of a series of smaller catchments and watersheds. The region's Fluvial Transect is itself defined by five interconnected zones.

JAMES DAVIDSON
ARCHITECT

WATER BLUEPRINT

THE FLUVIAL TRANSECT

Everyone living in the greater Brisbane River Catchment is linked via catchments and watersheds in one way or another. By taking an integrated water management approach, we are able to better address the issues and opportunities within local communities, and each actor in the fluvial transect is aware, and considerate of, the other. With this in mind, the Charrette established the following principles:

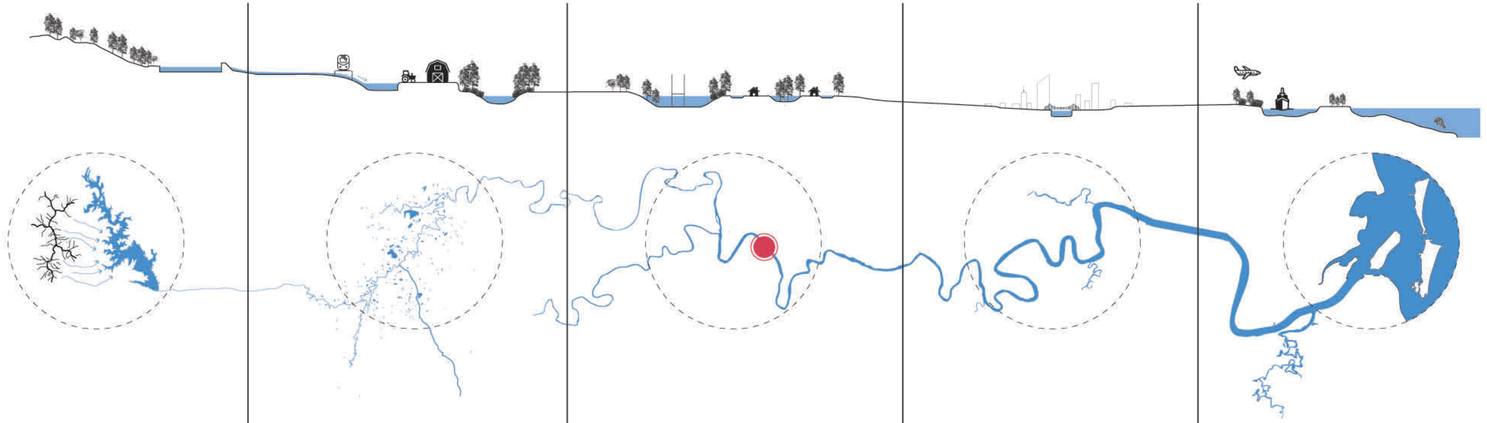
CONSERVE
WIVENHOE DAM
Maintain Quality > Store

TRANSITION
LOCKYER VALLEY
Store > Delay > Recharge

TRANSITION
BREMER & IPSWICH
Store > Delay

CONSTRICTED
BRISBANE
Store > Reuse

COASTAL
MORETON BAY
Adapt > Embrace



WATER QUALITY
- Improve water quality naturally through conservation and land stewardship
- Make use of the Western Corridor Recycled Water Scheme to improve flood storage capacity and protect drinking water supplies
- Investigate potential bypass pipe between Wivenhoe Dam and Mt Crosby
- Activating additional water-sensitive design strategies to help increase the Dam's flood storage capacity

ECO-AGRICULTURE
- Water-sensitive farm types and land management in the upper catchments
- Sediment control, ground water and nutrient replenishment
- Water delay and reduction of downstream flood risk
- Considering the western corridor pipeline as a potential nutrient supplier

SPONGE SUBURBIA
- Water-sensitive urban development
- Reduce sedimentation in local creeks and rivers
- Delay water and reduce fluvial and flash flooding risk downstream
- Improve public flood awareness
- Adapt public space amenity and recreational facilities
- Implement water-sensitive urban design principles and flood-aware architectural design solutions

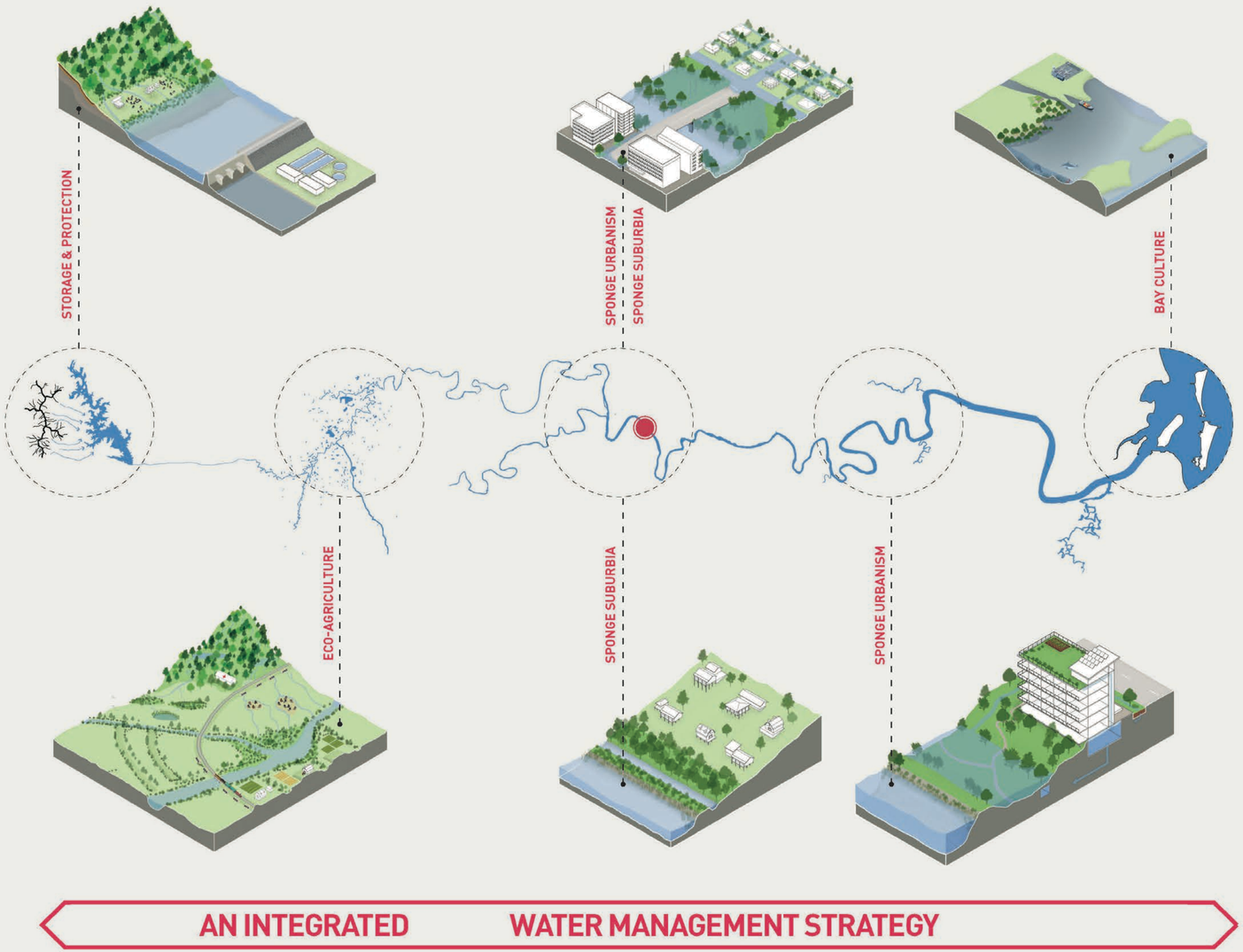
SPONGE URBANISM
- Retention parks, sponge streets and gullies, levee parks and flood plazas
- Permeable surfaces to encourage ground water recharge and storage
- Implement water-sensitive urban design principles and flood-aware architectural design solutions
- Revegetate local creeks to improve water quality and assist with delaying flood waters
- Urban agriculture

BAY-CULTURE
- Adapt to sea level rise and protect future communities through natural buffers and coastal ecologies
- Capitalise on managed sediment control and water quality improvements
- Embrace the bay and coast to encourage aquaculture production and create tourism opportunities

IN SUMMARY

After the charrette process was applied to the Brisbane River Catchment, participants identified a number of key outcomes to help design and define what a smart water future looks like for the region:

1. Consider moving the region's Mt Crosby water treatment plant closer to Wivenhoe Dam to avoid potential issues caused during flood events.
2. Revegetate riparian areas that shed water into the dam to filter and improve water quality.
3. The Lockyer Valley should be thought of in three broad geographical 'zones' - the mountain creeks, confluence zone and broad floodplain.
4. The broad floodplain should be allowed to flood slowly and naturally both in servicing the geological richness of the area and in mitigating risk to urban communities.
5. Infrastructure in the valley should be permeable, to avoid the damage caused by naturally occuring levees in the landscape.
6. Use better planning and design principles for key infrastructure: where possible, rail lines and roads should not be in vulnerable, low lying places prone to flooding if they can be built on higher ground or on the edge of the floodplain.
7. The planning approvals process should be updated to reflect the risk of flood, and it should be legislated that homes in the region be built to more resilient standards.
8. Consider implementing 'Sponge Suburbia' and 'Sponge Urbanism' principles in all existing and new developments across Ipswich and Brisbane City to slow and delay floodwaters, store water and recharge groundwater in the event of drought.
9. Implement water-sensitive urban design strategies to reduce water run-off and sediment reaching the Brisbane and Bremer Rivers while also considering filtering and improving water quality charging the river system.
10. Implement biodiversity strategies to remove sediment and other pollutants from Moreton Bay.



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Flood Resilient Homes Program

An initiative of

Dedicated to a better Brisbane

In partnership with

CITYSMART
Brisbane City Council's Sustainability Agency

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Virtual 360 Flood Hub

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The Flood Hub

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Part 2 - Flood resilient strategies

Sectional perspectives

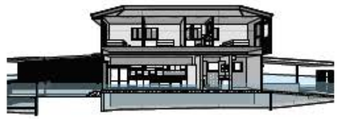
The following sectional perspectives illustrate a variety of different resilience strategies applicable to common building typologies in Queensland, both historic and contemporary. The typologies are classified into New and Retrofit categories. The water levels shown in these diagrams indicate a hypothetical flood event.[5]

Sectional perspective 1
New home
Lightweight | VJ Board

Sectional perspective 2
New home
Lightweight | Rendered FC

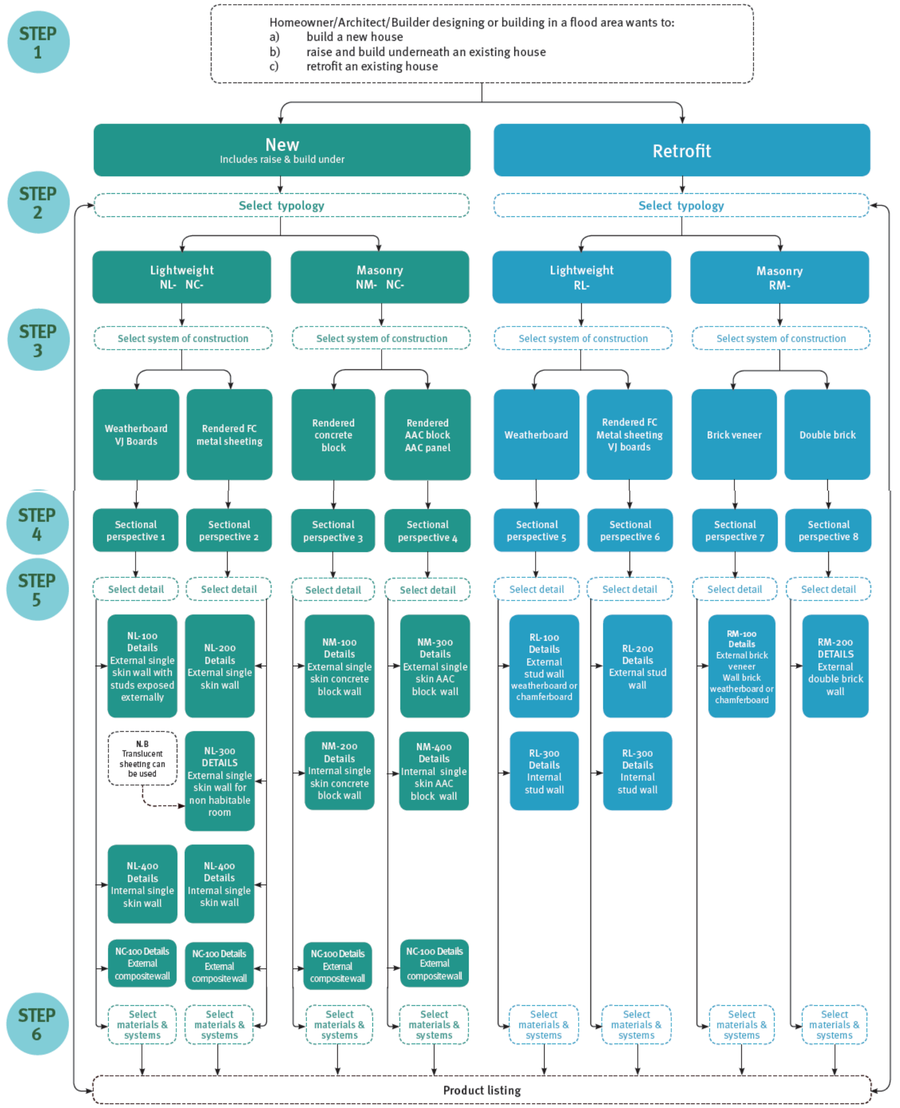
Sectional perspective 3
New home
Masonry | Rendered Concrete Block

Sectional perspective 4
New home
Masonry | Rendered AAC Block



[5] The Requirements of the Queensland Development Code must be met with respect to elevation of the finished floor level.

Figure 1. User guide flowchart



QRA Flood Resilient Building Guidance for Queensland Homes

JAMES DAVIDSON ARCHITECT

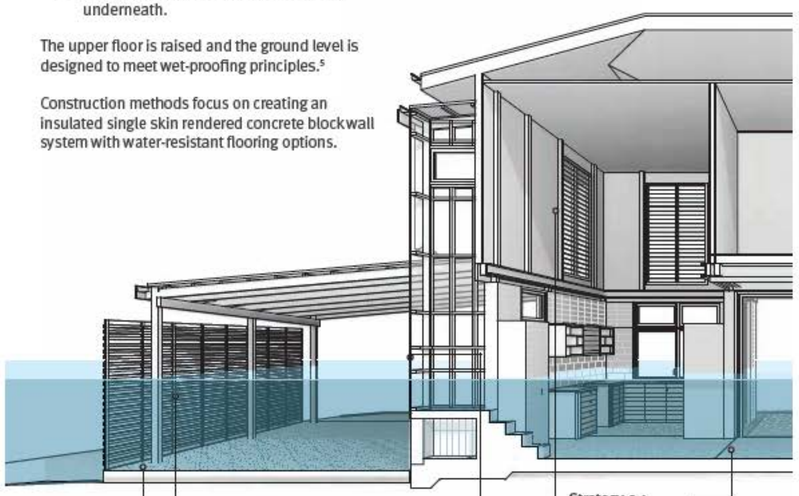
Sectional perspective 3

The design strategies, materials and associated construction details contained in this building type are relevant for:

- new construction
- raising an existing house and building underneath.

The upper floor is raised and the ground level is designed to meet wet-proofing principles.[5]

Construction methods focus on creating an insulated single skin rendered concrete blockwall system with water-resistant flooring options.



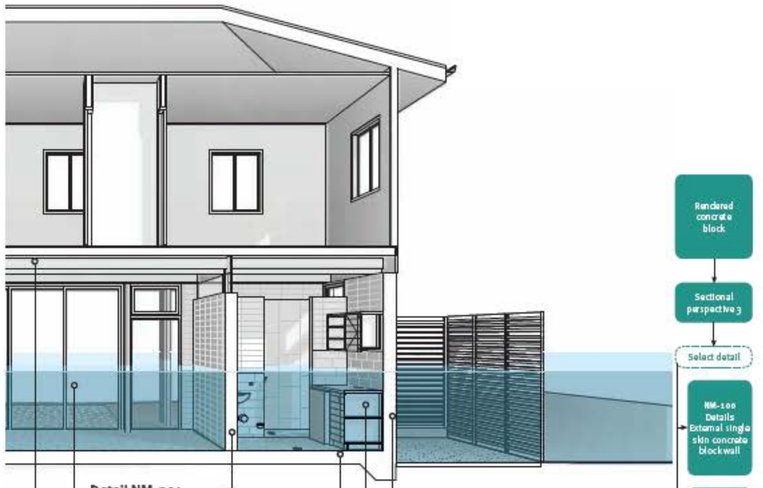
Strategy 1.2
Permeable hardwood screening.

Strategy 1.8
External hard landscaping falls away from the house.

Strategy 9.1
Polished and sealed concrete slab.

Strategy 9.3
Internal void to allow the relocation of contents upstairs prior to a flood event.

Detail NL-301
Stud wall with exposed hardwood framing adjacent a non-habitable space.



Detail NM-201
Internal rendered concrete blockwall.

Strategy 2.6
Internal non-return valves on plumbing services.

Strategy 13.1
Aluminium and glass doors.

Strategy 15.1
Removable water-resistant cabinetry for relocation above flood waters prior to a flood event.[6]

Detail NM-101
External rendered concrete block wall.

Strategy 9.2
No ceiling linings to steel or hardwood structure (depending on flood heights).

New

Masonry | Rendered Concrete Block

QRA Flood Resilient Building Guidance for Queensland Homes

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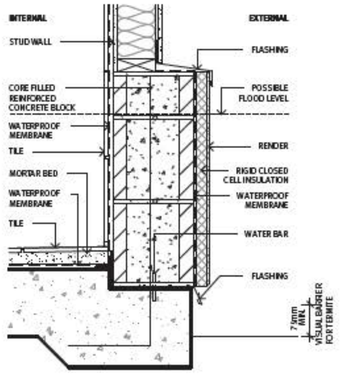
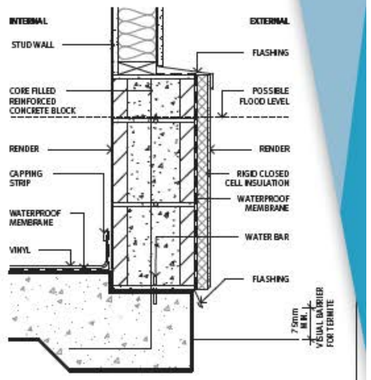


TYPOLOGY: COMPOSITE - LIGHTWEIGHT/MASONRY
WALL TYPE: EXTERNAL | CONCRETE BLOCK AND STUD WALL
FLOOR FINISH: CONCRETE FLOOR FINISH
R-VALUE: 1.63
CODE: NC-103

Structure:	Core filled reinforced concrete block to above flood level. Standard stud wall construction on top of blockwork.
Insulation:	Rigid closed cell insulation
External lining:	Render
Internal lining:	Tile + waterproof membrane to above flood level
Skirting:	N/A
Floor finish:	Tile + bedding + waterproof membrane

NC-103
External | composite wall
Tile floor finish | wet area



TYPOLOGY: COMPOSITE - LIGHTWEIGHT/MASONRY
WALL TYPE: EXTERNAL | CONCRETE BLOCK AND STUD WALL
FLOOR FINISH: CONCRETE FLOOR FINISH
R-VALUE: 1.6
CODE: NC-104

Structure:	Core filled reinforced concrete block to above flood level. Standard stud wall construction on top of blockwork.
Insulation:	Rigid closed cell insulation
External lining:	Render
Internal lining:	Render
Skirting:	Coved vinyl or other water resistant skirting
Floor finish:	Vinyl + waterproof membrane

NC-104
External | composite wall
Vinyl floor finish

New
Lightweight + Masonry | Composite Wall

Strategy reference	Flood resilient strategy	Diagram
9	**Internal floors and ceilings**	
9.1	**Install water-resistant flooring** (£) Refer to the **Flood resilient materials table and product listing.**	
9.2	**Design ceilings without linings and cavities** (+) (£) This strategy is only recommended where flood waters reach ceiling height. Ceilings under roofs are typically used as diaphragms for horizontal loading. If removed, an alternative mechanism may be required.	
9.3	**Design internal voids and elevated storage spaces** (£) Internal voids and elevated storage spaces above the possible flood line can be used to relocate house contents out of the way of waters before a flood. Spaces intended for such use need to be designed for appropriate imposed loads.	
10	**Internal walls**	
10.1	**Install water-resistant linings** (£) Refer to the **Flood resilient materials table and product listing.**	
11	**Wet areas**	
11.1	**Avoid baths with low height cavity walls** (£) Alternatives are: • free standing baths that can be cleaned underneath • showers	
12	**Internal stairs**	
12.1	**Design without cavities under stairs** (£) To enable post-flood clean-out, the following strategies may be appropriate: • remove all cavities under stairs that are below the possible flood line and replace with open bolt-fixed removable treads made of water-resistant materials • replace the existing stair with a solid concrete stair below the possible flood line. Refer to the **Flood resilient materials table and product listing.**	

Chelmer Flood House

JAMES DAVIDSON
ARCHITECT

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Designing homes that accept water on the floodplains of Brisbane River

23 OCTOBER 2018 FEATURE

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“This is an example of a home we’ve been able to reassess and provide that extra relief for our customers because of the actions that they’ve taken. Simply if we reduce the risk, we reduce the premium.”
Josh Kelland (Suncorp Executive Manager Consumer Products)

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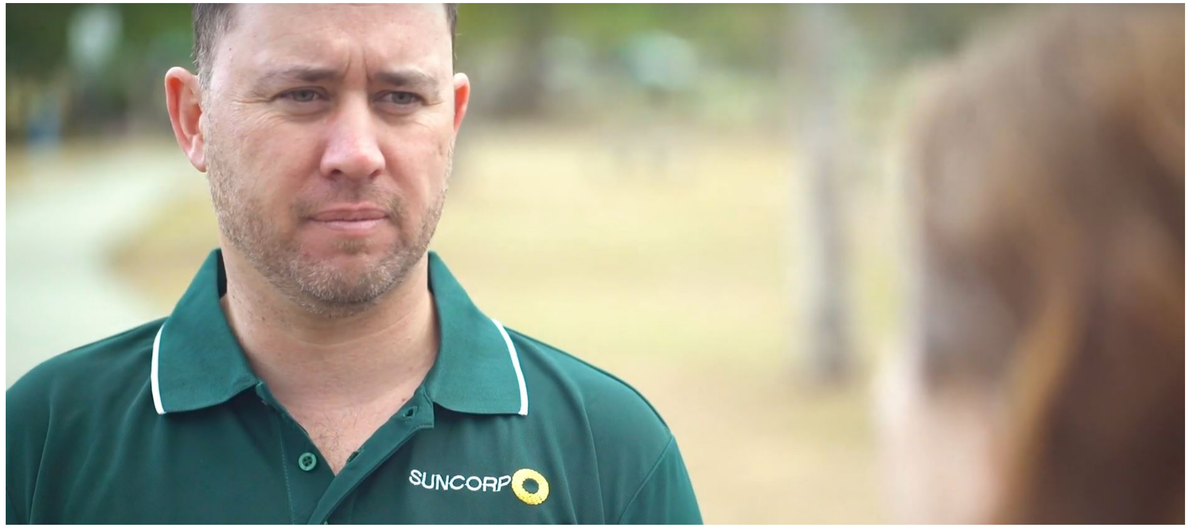
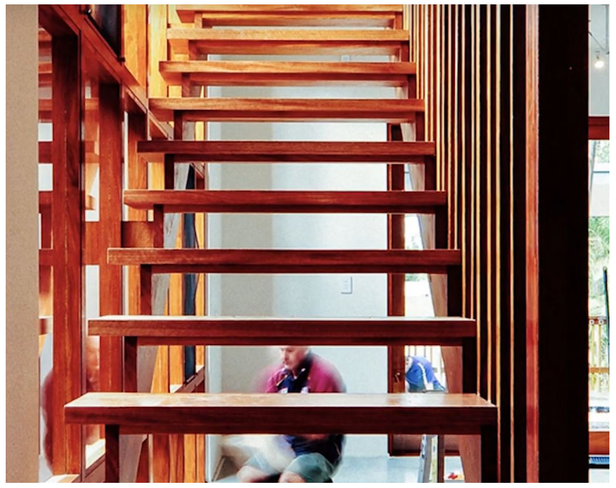
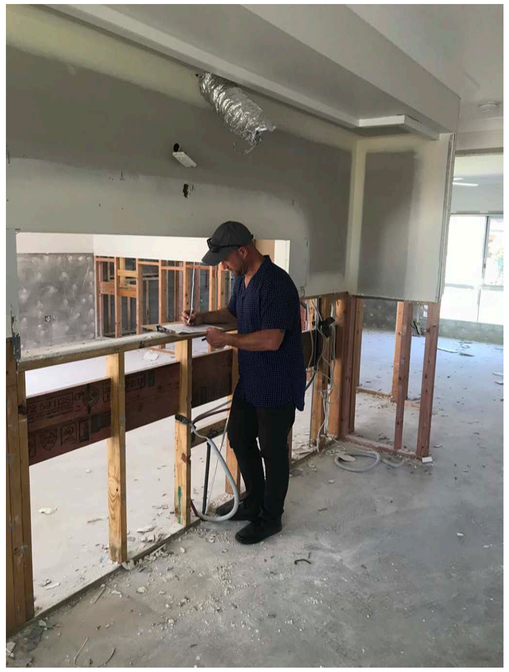
ARCHITECT





“What we’ve been able to do is assess this property individually which has led to a 50% reduction in their insurance premium”
Josh Kelland (Suncorp Executive Manager Consumer Products)



Townsville Flood Resilience Assessments - Suncorp

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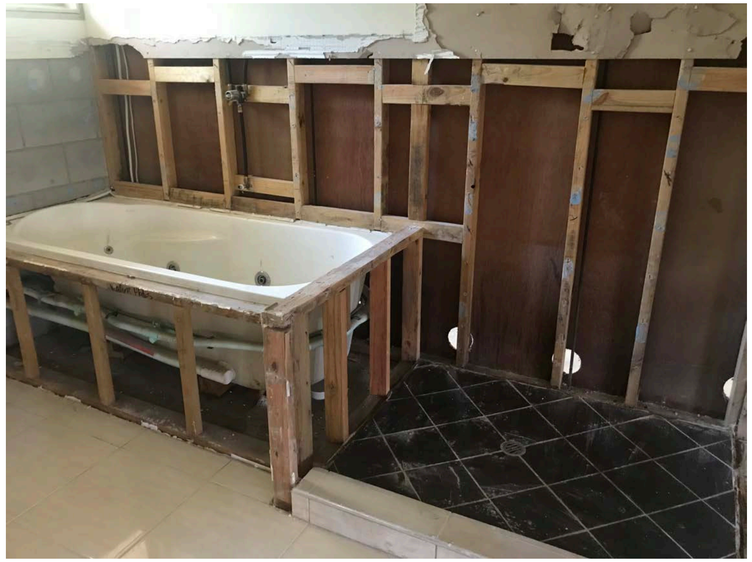

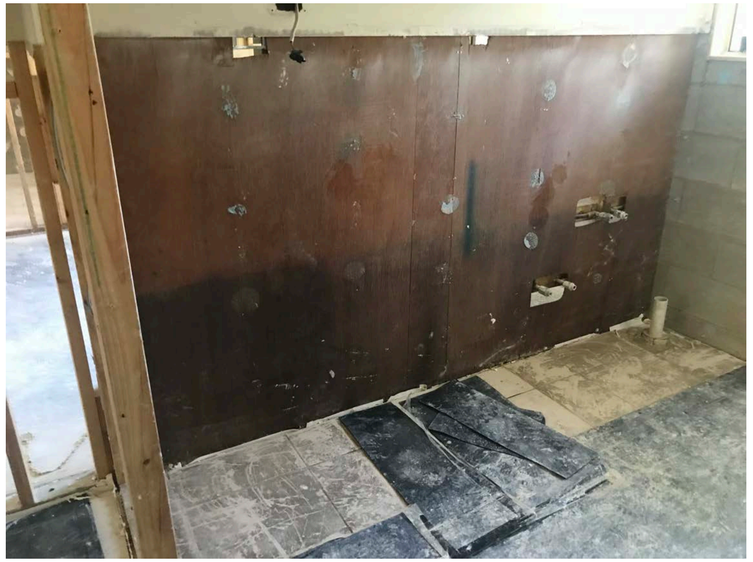

Townsville Flood Resilience Assessments - Suncorp

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Townsville – Appropriate Housing Typologies & Planning
Is the Gold Coast next???

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NCEconomics

The economics of flood resilient buildings

Table 6. *Results of CBA – single story slab on ground*

Flood frequency	AEP 10	AEP 20	AEP 50	AEP 100	AEP 200
Current climate					
Benefit-cost ratio					
5th percentile	14.7	7.3	3.3	1.7	0.7
Average	19.6	9.7	4.4	2.3	1.0
95th percentile	27.9	13.9	6.3	3.3	1.4
Payback period (years)					
Low	1	2	5	11	Never

Key findings

- Under current climate conditions, resilient building under all AEP up to at least 100.
- Under future climate change scenarios, the economic case for resilient flooding becomes even greater. Given the long economic life of buildings, it would be prudent to incorporate the additional risks attributable to climate change into decision making.
- Given the clear case for resilient building and the presence of buildings in the BRSFMP dataset with AEPs as low as 10, there is a clear case for policy intervention.

Thank you

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