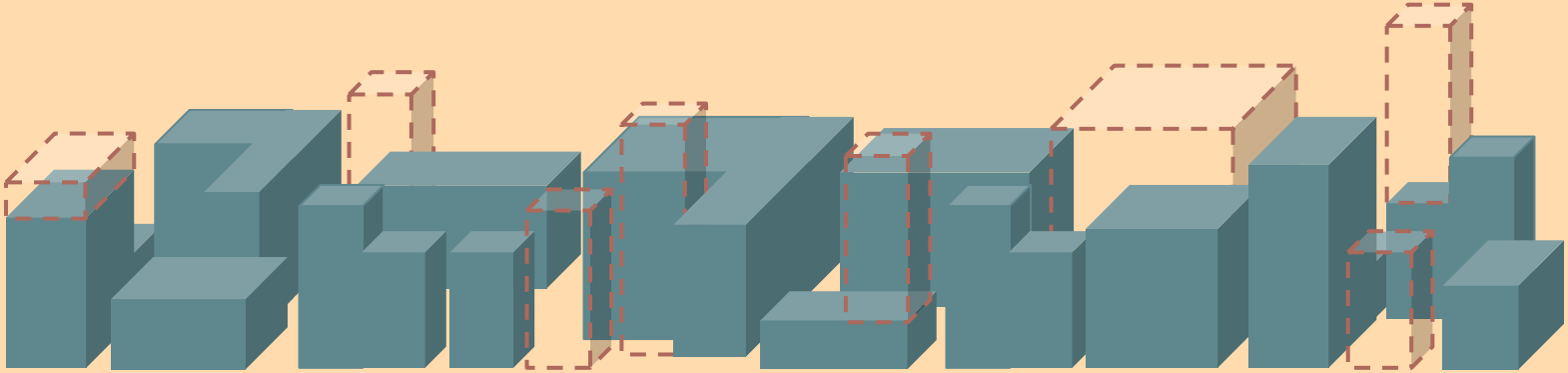
Adjudicating by Algorithm

Scripting building regulations to generate permissible forms

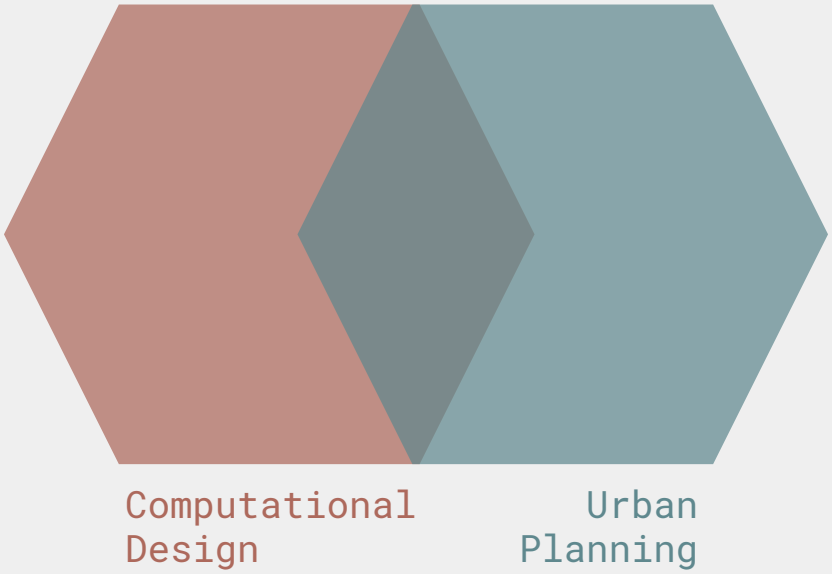
Creating a web platform for interaction with the law



Research Area

‘...urban planning needs to be flexible and dynamic with a view to the future.’

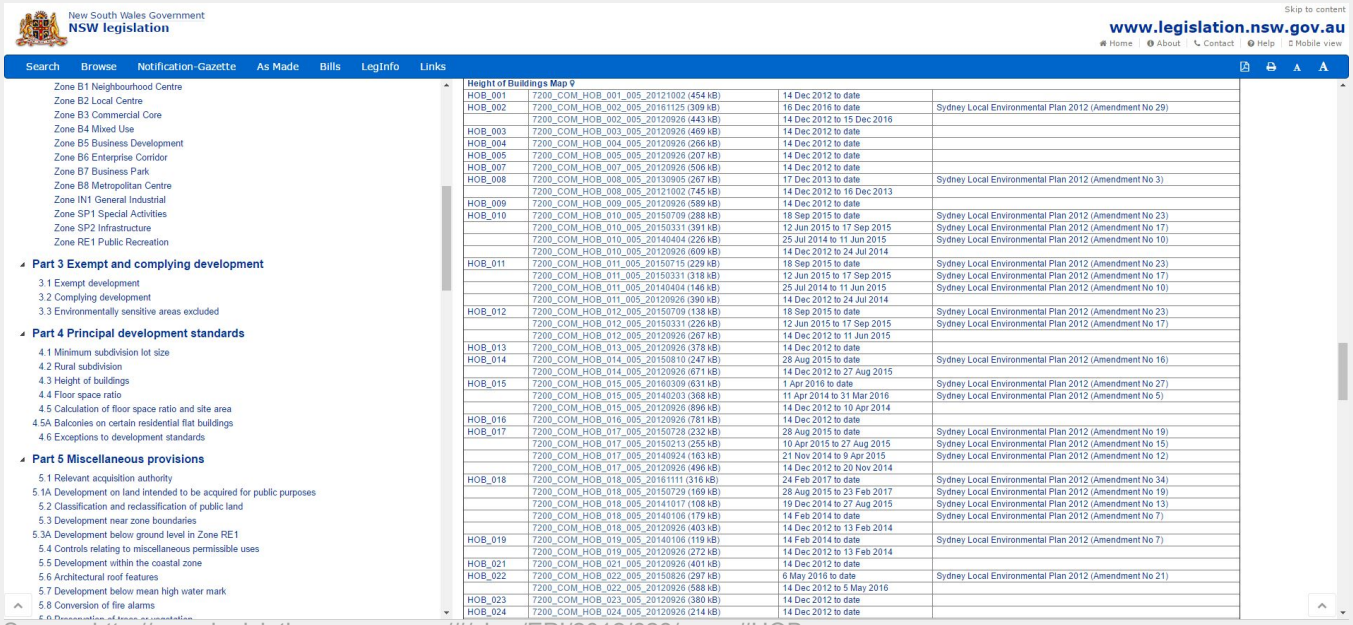
(Verebes, 2014)



Problems in Urban Planning

"Zoning maps are two-dimensional and fail to provide a clear picture of the code's impact on development"

(Didech, 2015)



Source: http://www.legislation.nsw.gov.au/#/view/EPI/2012/628/maps#HOB

David Haron, NSW Dept. of Planning

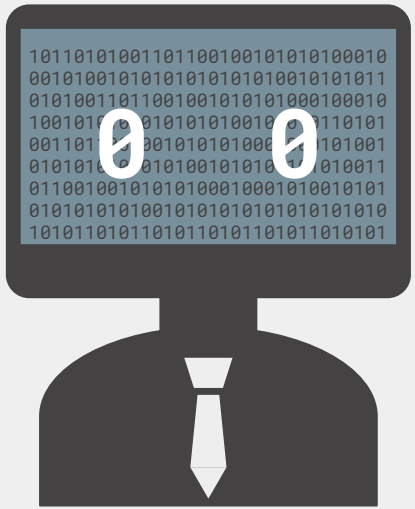
‘Essentially, if you want a modern planning system, you need modern tools and a modern way of thinking about it, and that's digital.’

Law

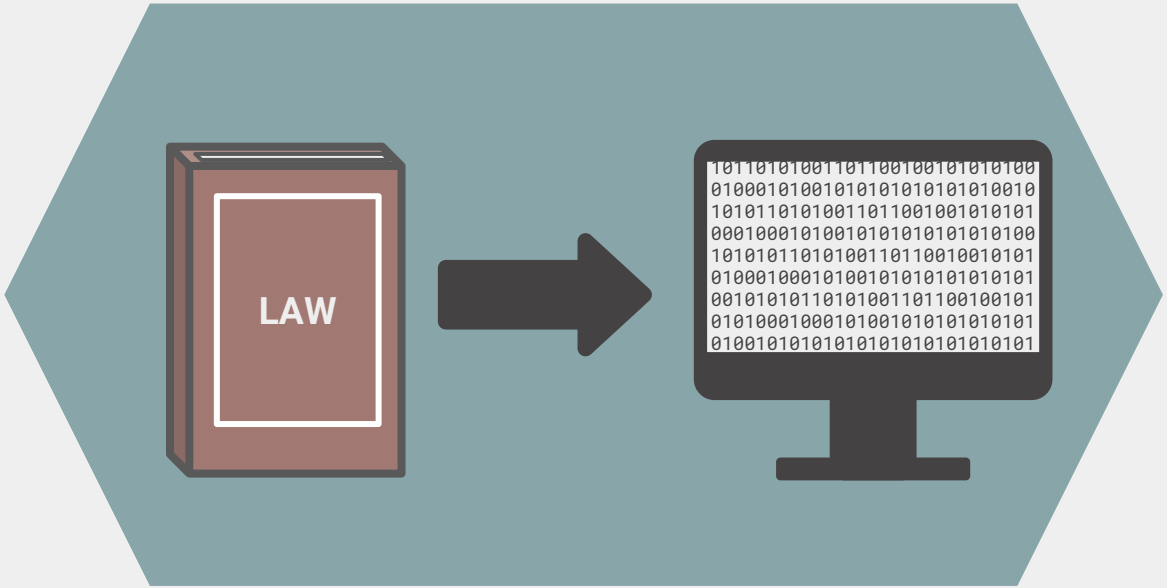
‘The sheer number and size of regulations can be daunting.’

(Genesereth, 2015)

Computational law



Law as code


LAW
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10101101010011011001001010101
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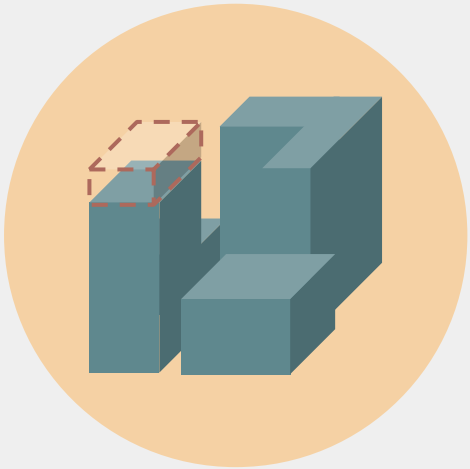
01000100010100101010101010101
00101010110101001101100100101
01010001000101001010101010101
01001010101010101010101010101

Aims:

- How the application of “law as code” can benefit urban planning
- To investigate how open data can help inform better urban planning decisions
- Hypothesise how ‘Law as Code’ and 3D representation of the law could be implemented

2 research projects



1. Translate building regulations into a script to create building envelopes

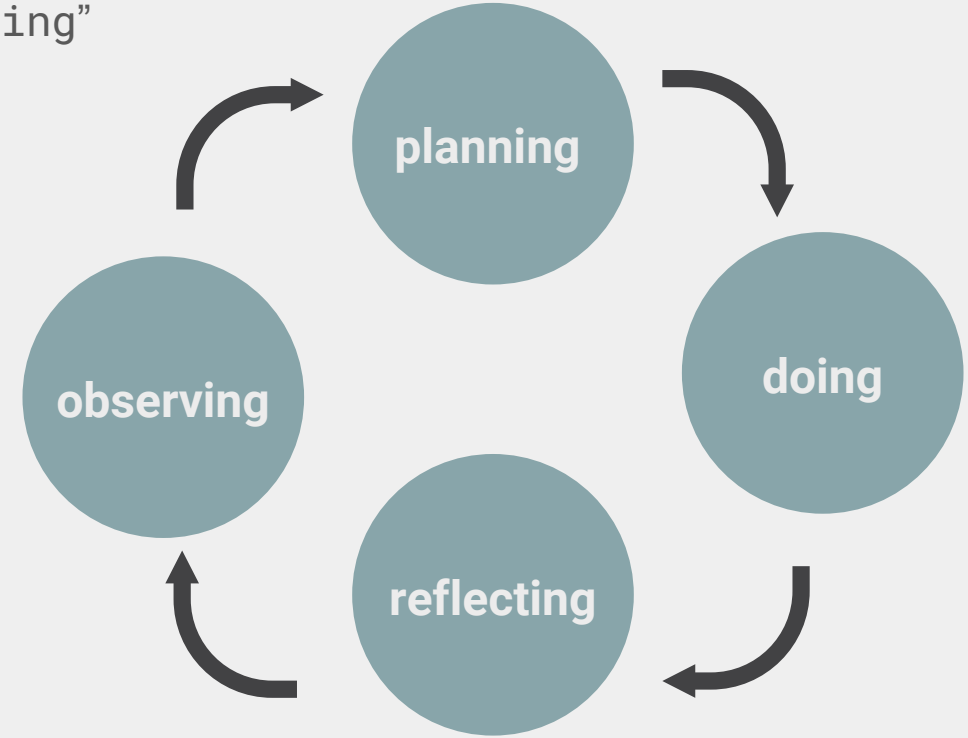
2. Create an open source decision support system

Methodology

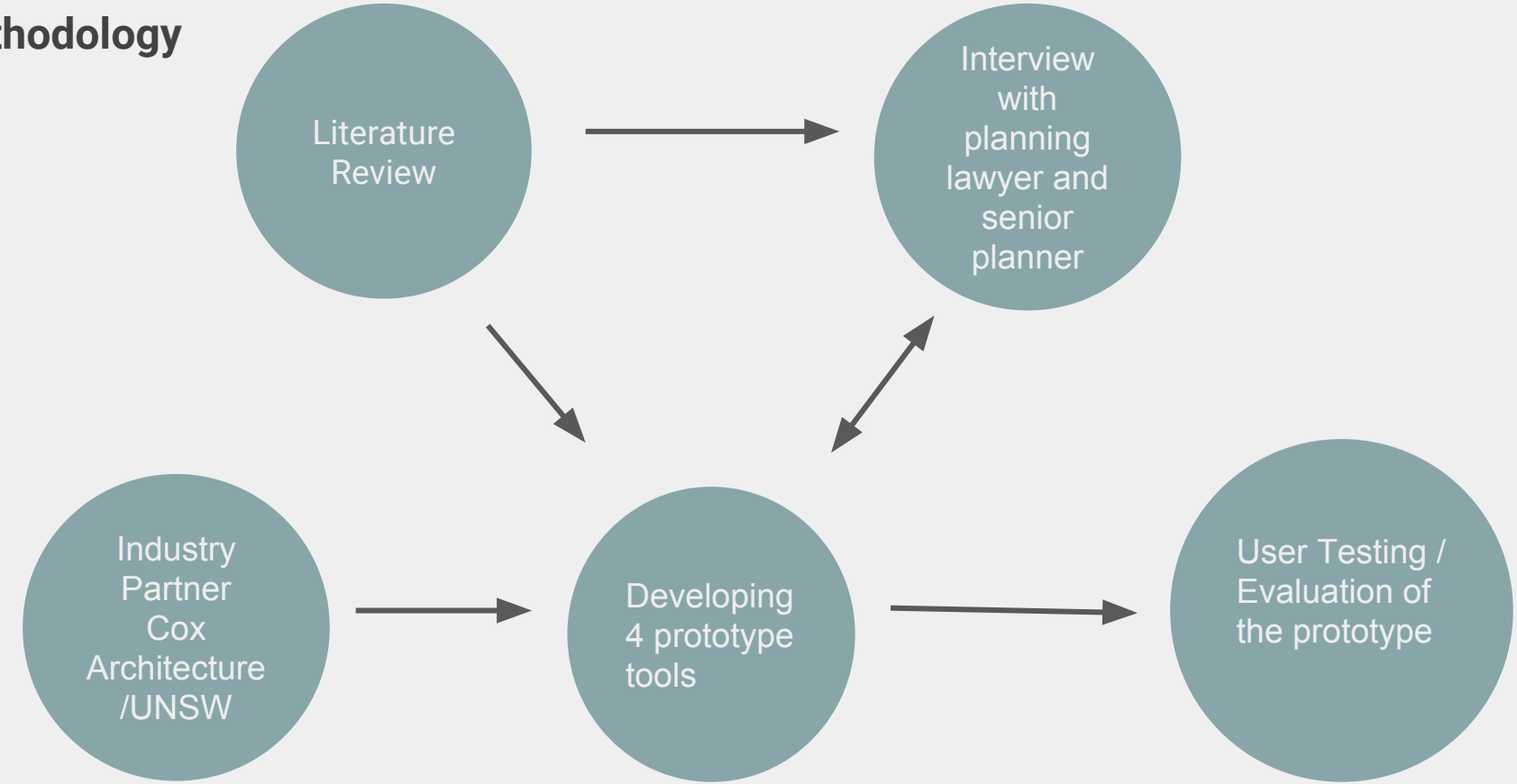
Action based research

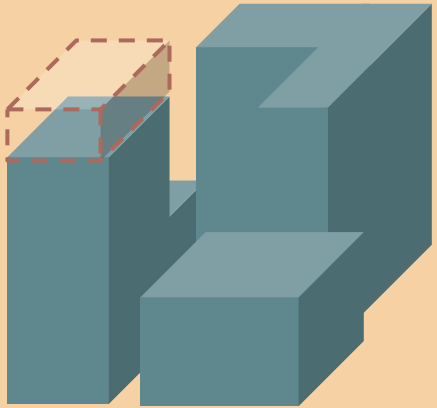
“learning by doing”

(O'Brien, 1998)

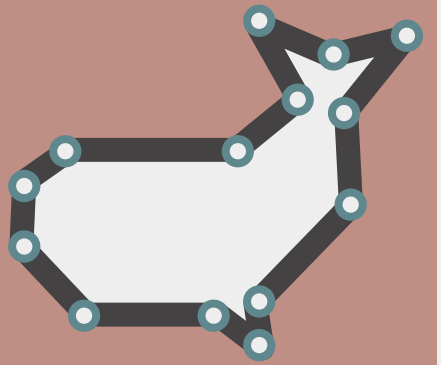


Methodology



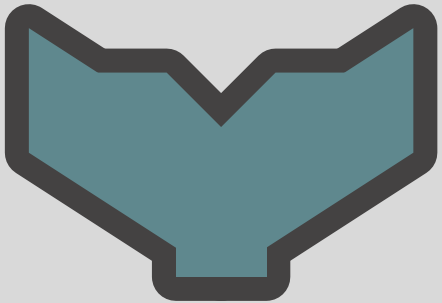


Beluga:
script



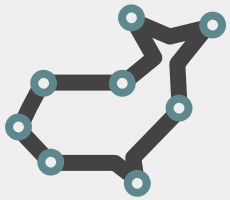
Humpback:
GIS translator

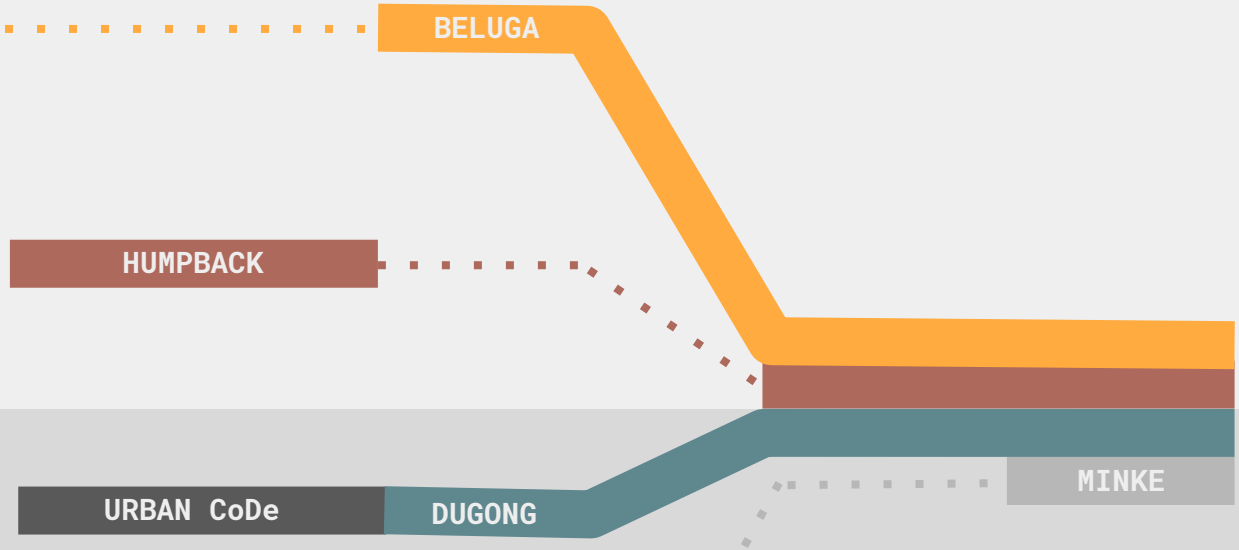
Dugong:
web app



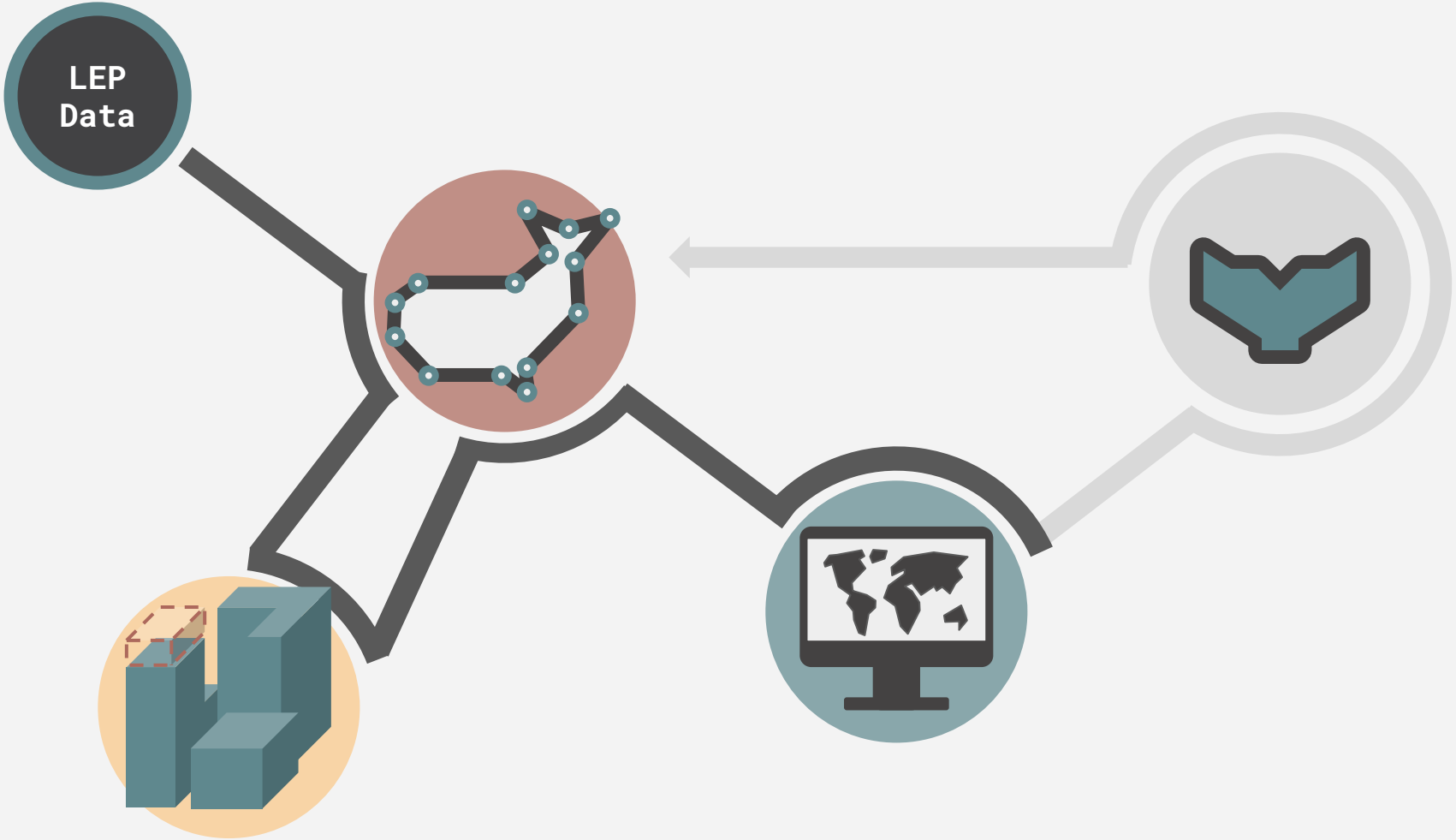
Minke:
versioning tool

Nazmul



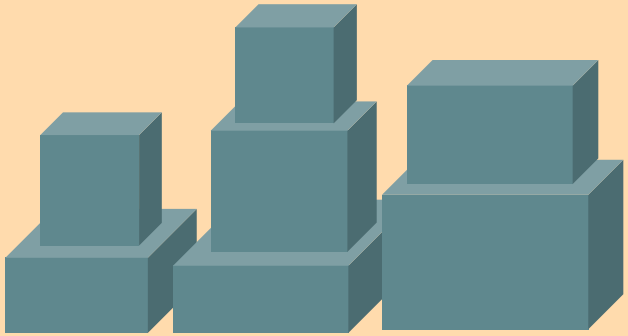


Madeleine

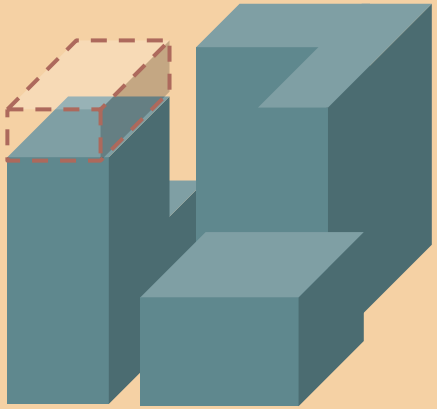

LEP
Data

Objective:

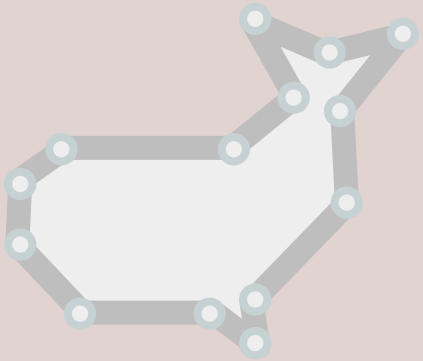
Create a script that encodes building regulations,
and use it to generate **permissible building envelopes**



what is a permissible building envelope?



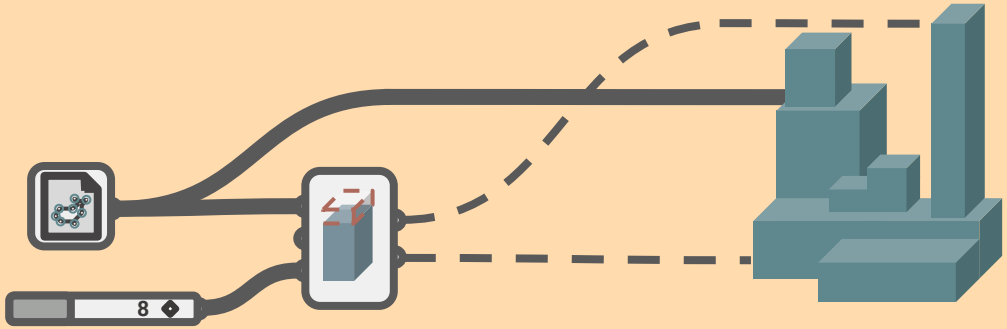
Beluga: script



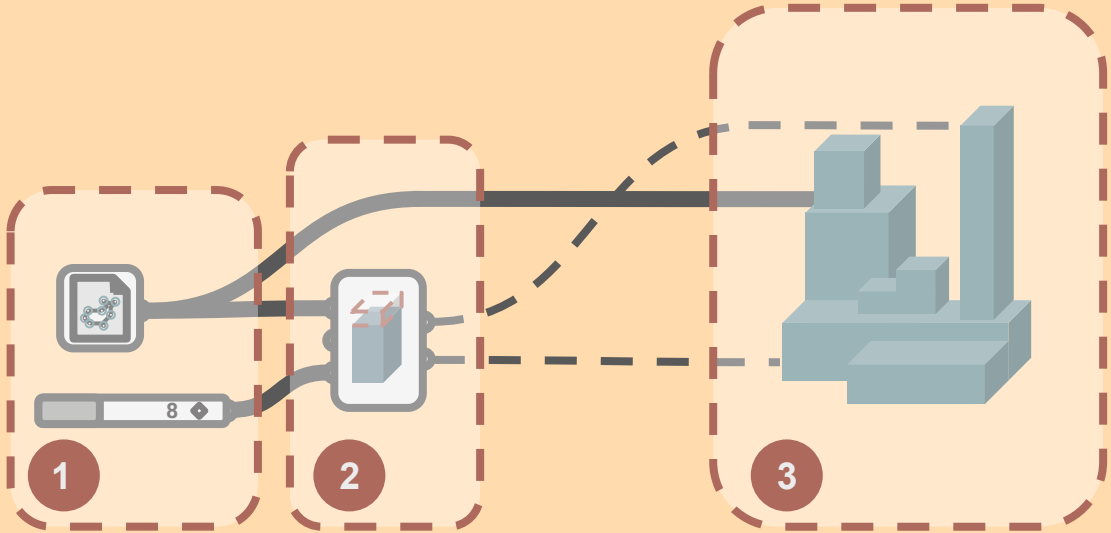
Humpback: GIS translator

Dugong: web app

Minke: versioning tool



Beluga:
script


8
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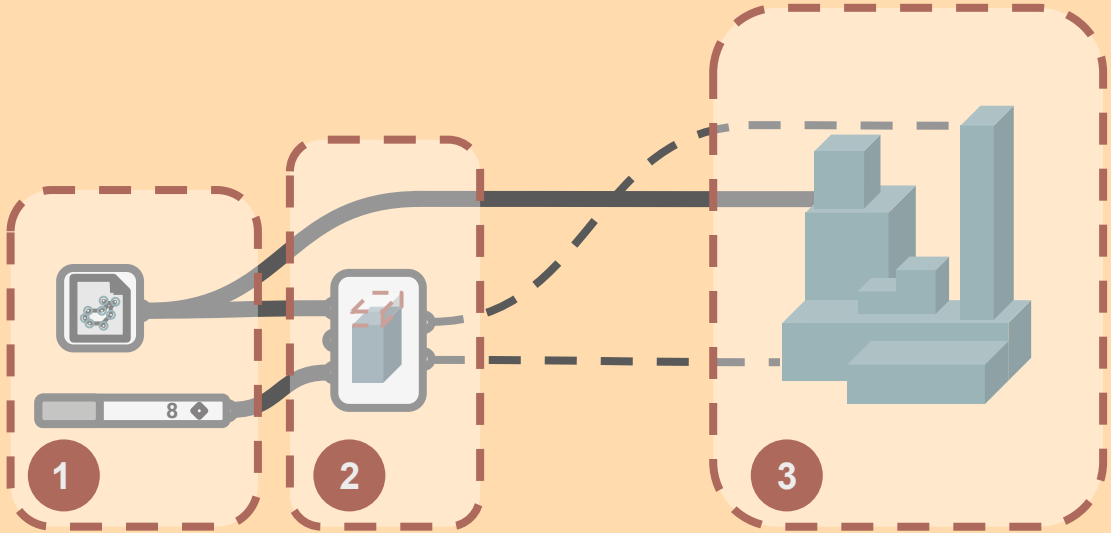
2
3



- Cadastral lots
- HOB
- FSR
- Solar planes
- Setback

Sydney Local Environmental Plan 2012

Height of Buildings Map
- Sheet HOB_015

Maximum Building Height (m)

A	3	W2	42	Area 7	
E	6	X	45		
H	7.5	Y	50		
I	8	Z	55		
J	9	AA1	60		
L	11	AA2	65		
M	12	AA3	70		
O	15	AB1	80		
P	18	AB2	85		
R	22	AC	110		
S	24	AD	130		
T1	25	AE	150		
T2	27	AH	235		
T3	28	Area 1			
T4	29	Area 2			
U1	30	Area 3			
U2	33	Area 4			
V	35	Area 5			
W1	40	Area 6			

Maximum Building Height (m)
Heights shown on map in RL (m)

10 - 20	60 - 70
20 - 30	70 - 80
30 - 40	90 - 100
40 - 50	110 - 120
50 - 60	

Cadastre

Cadastre 09/03/2016 © City of Sydney

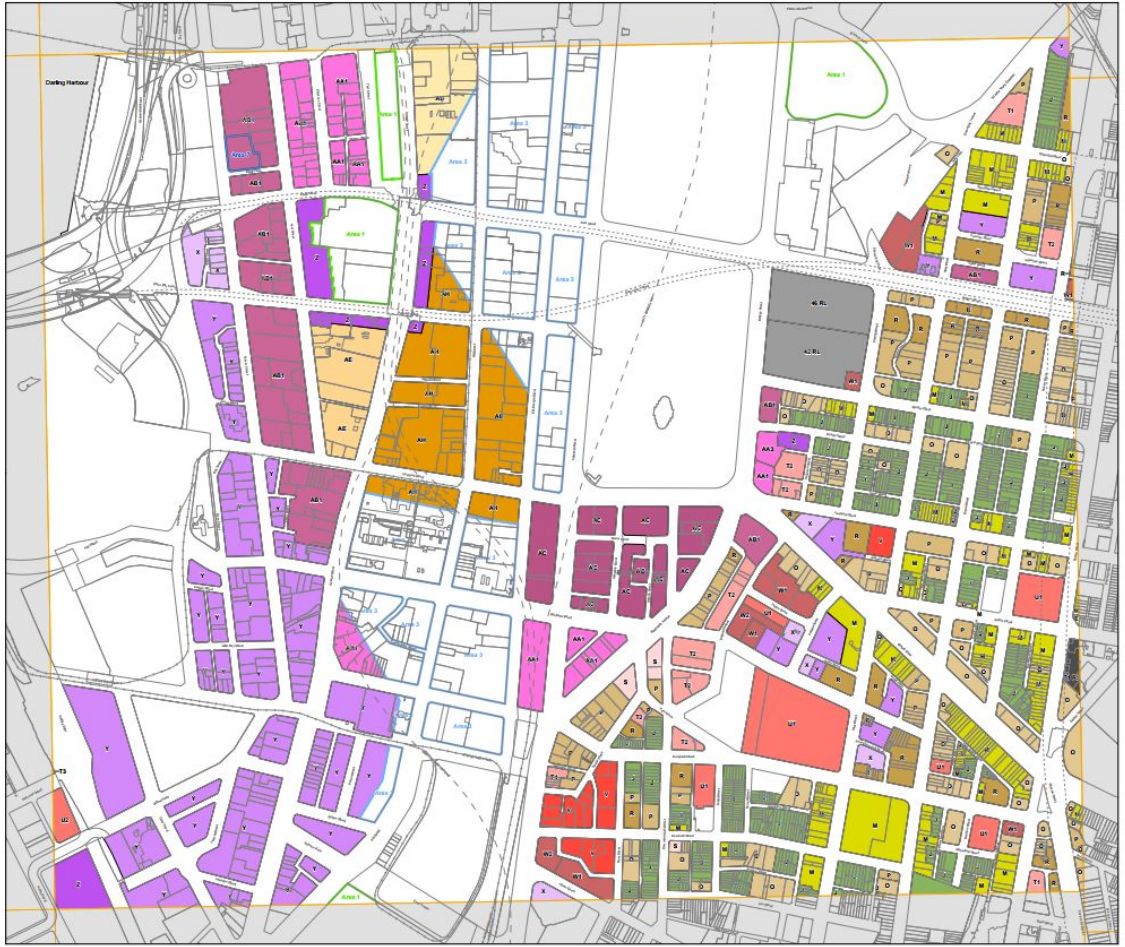
N

0 200 m

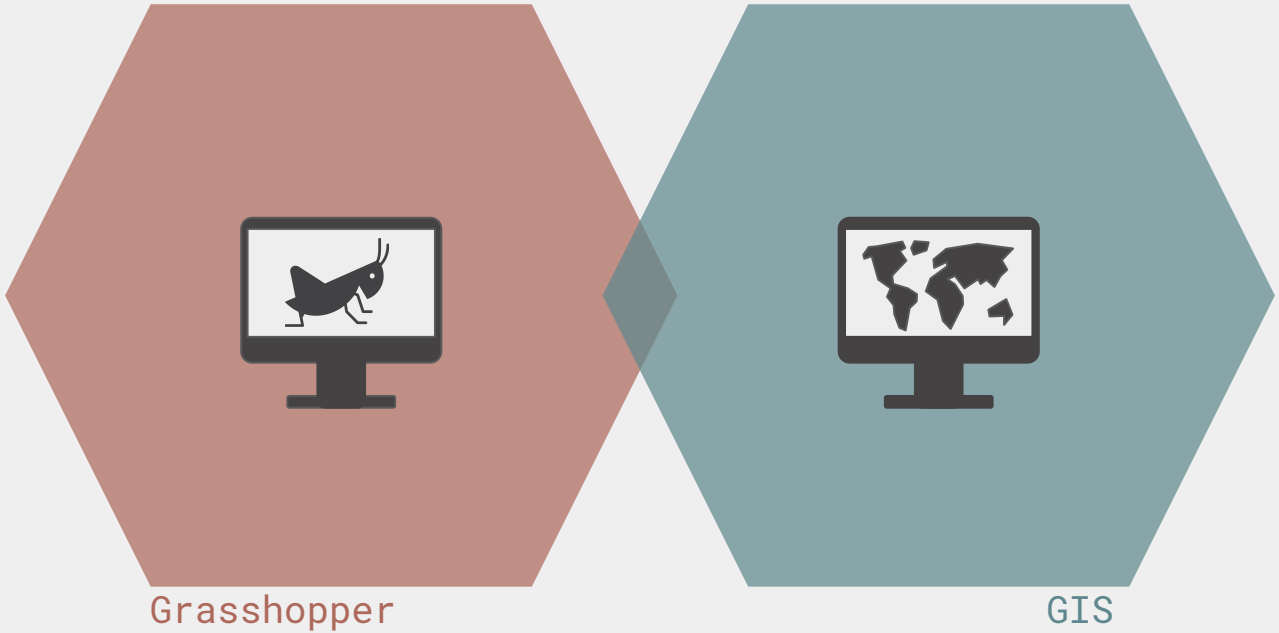
Scale: 1:5,000 @ A3

Projection: GDA 1994
Zone 56

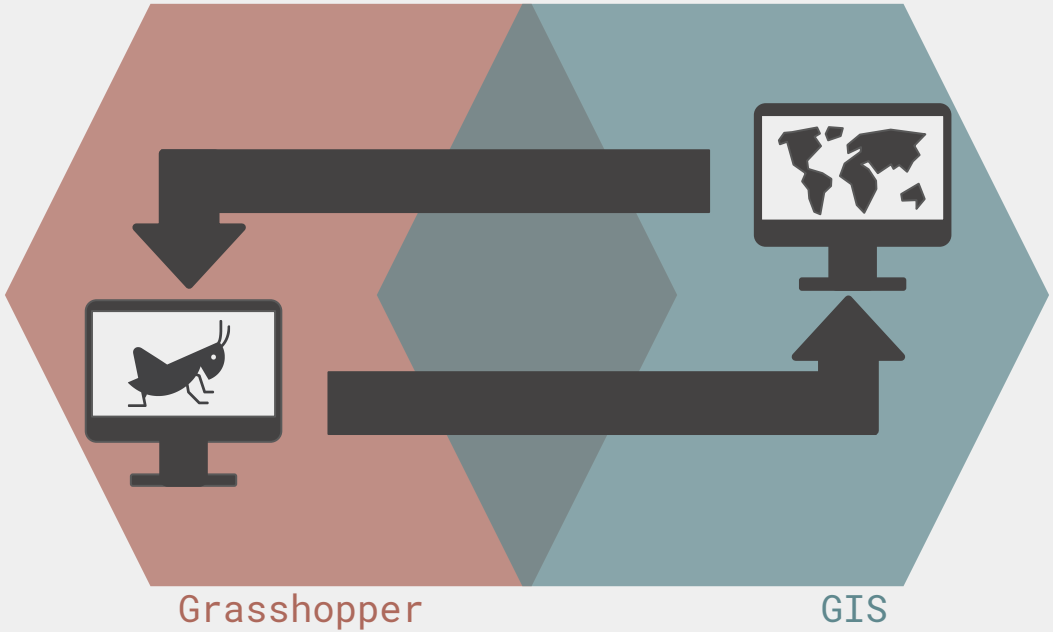
Map identification number:
7100_COM_HOB_015_005_20160309

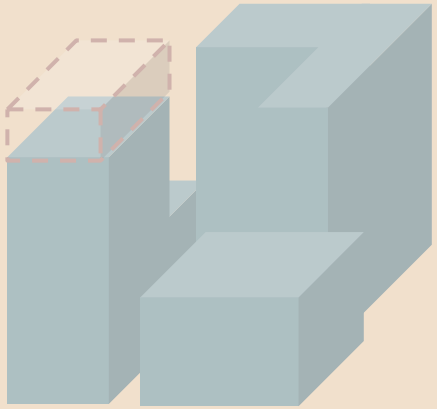


Problems in Urban Planning

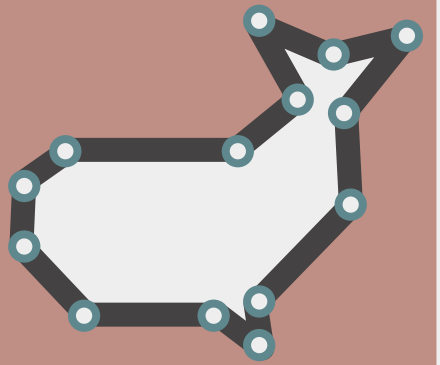


Data interchange formats for GIS



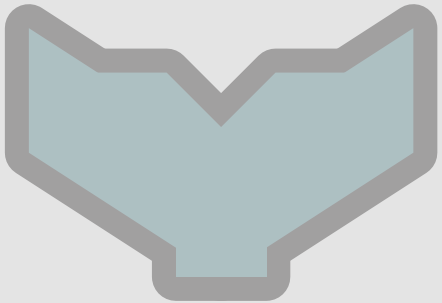


Beluga:
script

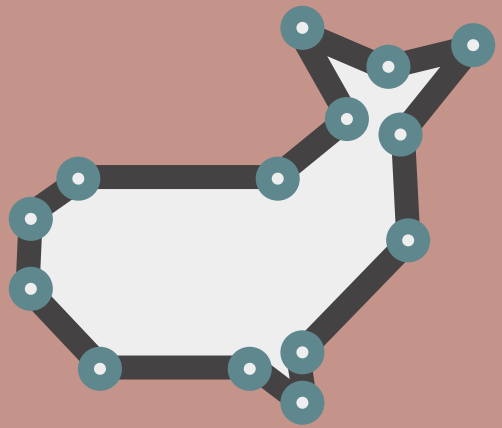


**Humpback:
GIS translator**

Dugong:
web app



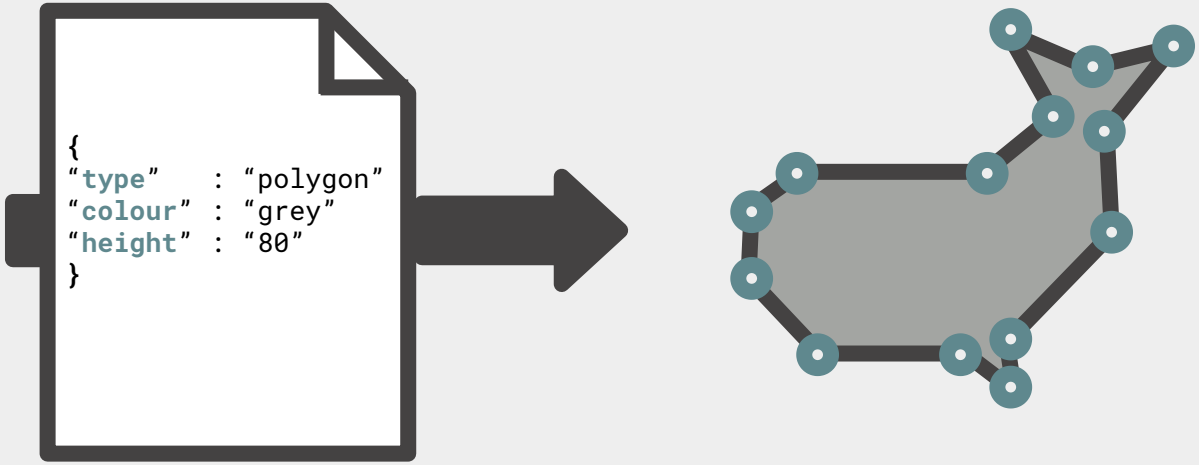
Minke:
versioning tool



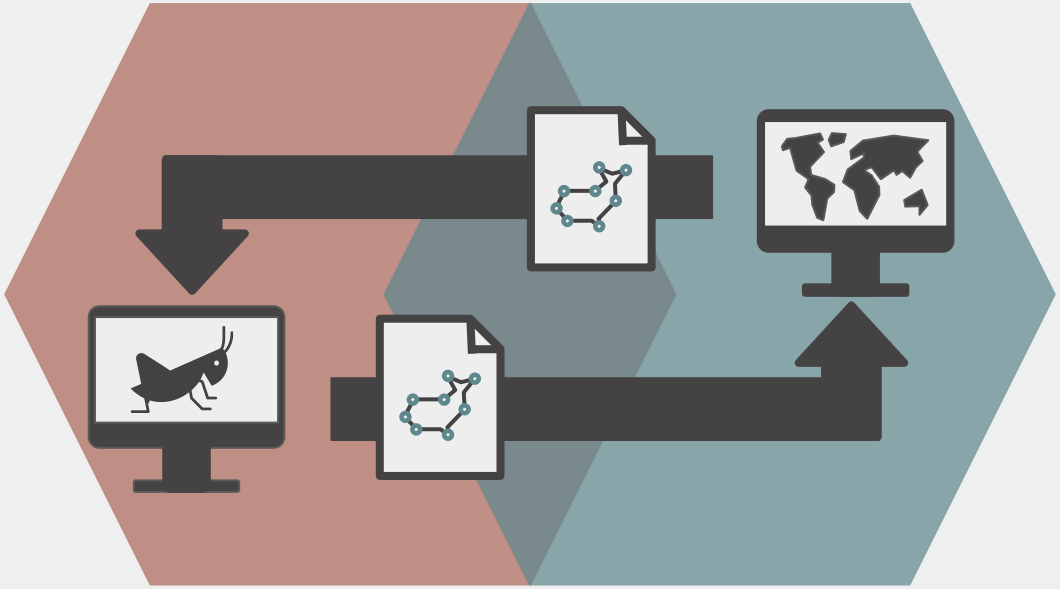
Humpback:
GIS translator

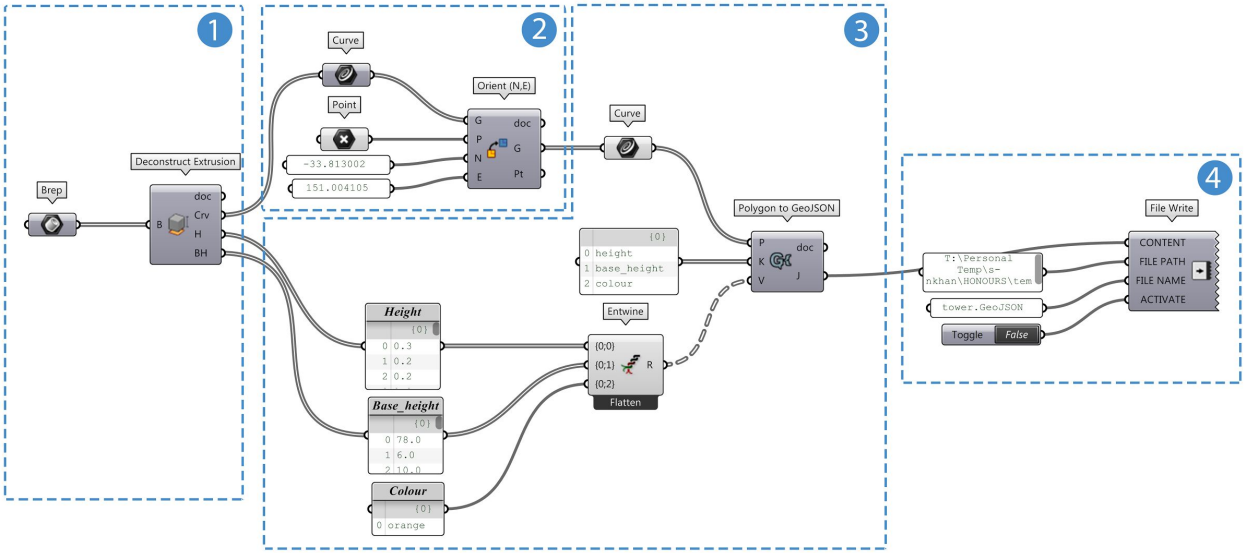
GeoJSON

“easy for humans to read and write... and easy for machines to parse and generate”



(json.org, 2017)


Grasshopper
GIS


1
2
3
4
Curve
Orient (N,E)
Point
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151.004105
G
P
N
E
doc
G
Pt
Curve
Brep
Deconstruct Extrusion
B
doc
Crv
H
BH
{0}
0 height
1 base_height
2 colour
Polygon to GeoJSON
P
K
V
doc
J
File Write
CONTENT
FILE PATH
FILE NAME
ACTIVATE
T:\Personal Temp\s-nkhan\HONOURS\tem
tower.GeoJSON
Toggle
False
Height
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1 0.2
2 0.2
Base_height
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1 6.0
2 10.0
Colour
{0}
0 orange
Entwine
{0;0}
{0;1}
{0;2}
R
Flatten

HUMPBACK (by nazmulkhan)

GeoJSON tool by COX ARCHITECTURE*

Components:

- ORIENT (N,E) - Orients geometry to specified Northing and Easting Coordinates
- POLYGON TO GEOJSON - Writes a polygon to a GeoJSON file, where keys and values can be defined.
- GEOJSON TO POLYGON - Converts GeoJSON into Grasshopper geometry
- DECONSTRUCT EXTRUSION - Deconstructs simple extrusions into polylines, heights, and base heights for later use in 'Polygon to GeoJSON component'.
- GEOJSON MERGE - Merges multiple GeoJSON FeatureCollection files as one FeatureCollection.
- FILE WRITE - Exports text files

VISUALISE YOUR GEOJSONS!

To render your GeoJSON files online, visit: https://madeleineiohanson.github.io/UrbanCoDe

+ more

Category: Urban Planning & City Modeling
License: Free

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10 votes

Downloads: 566

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Support Email
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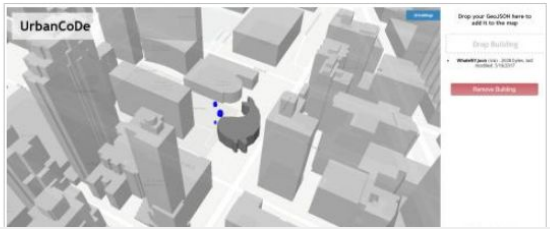
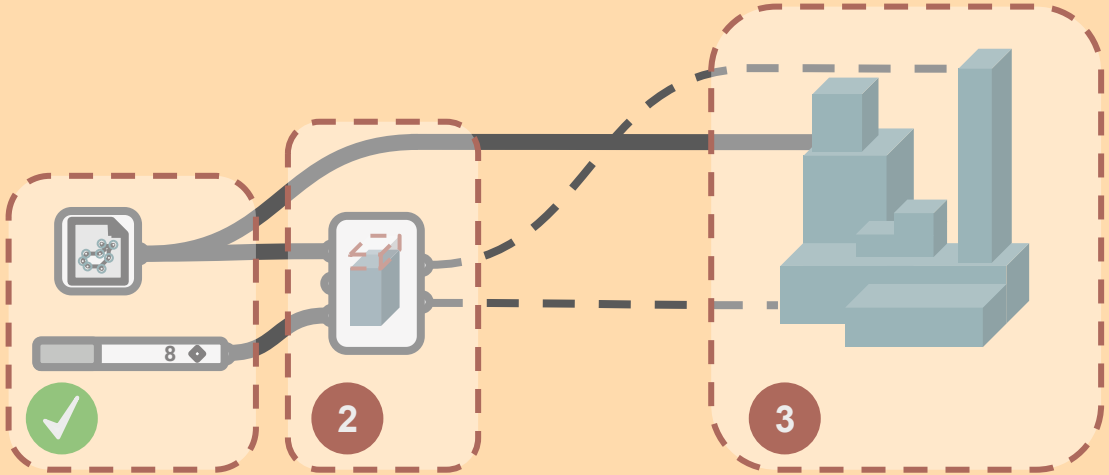


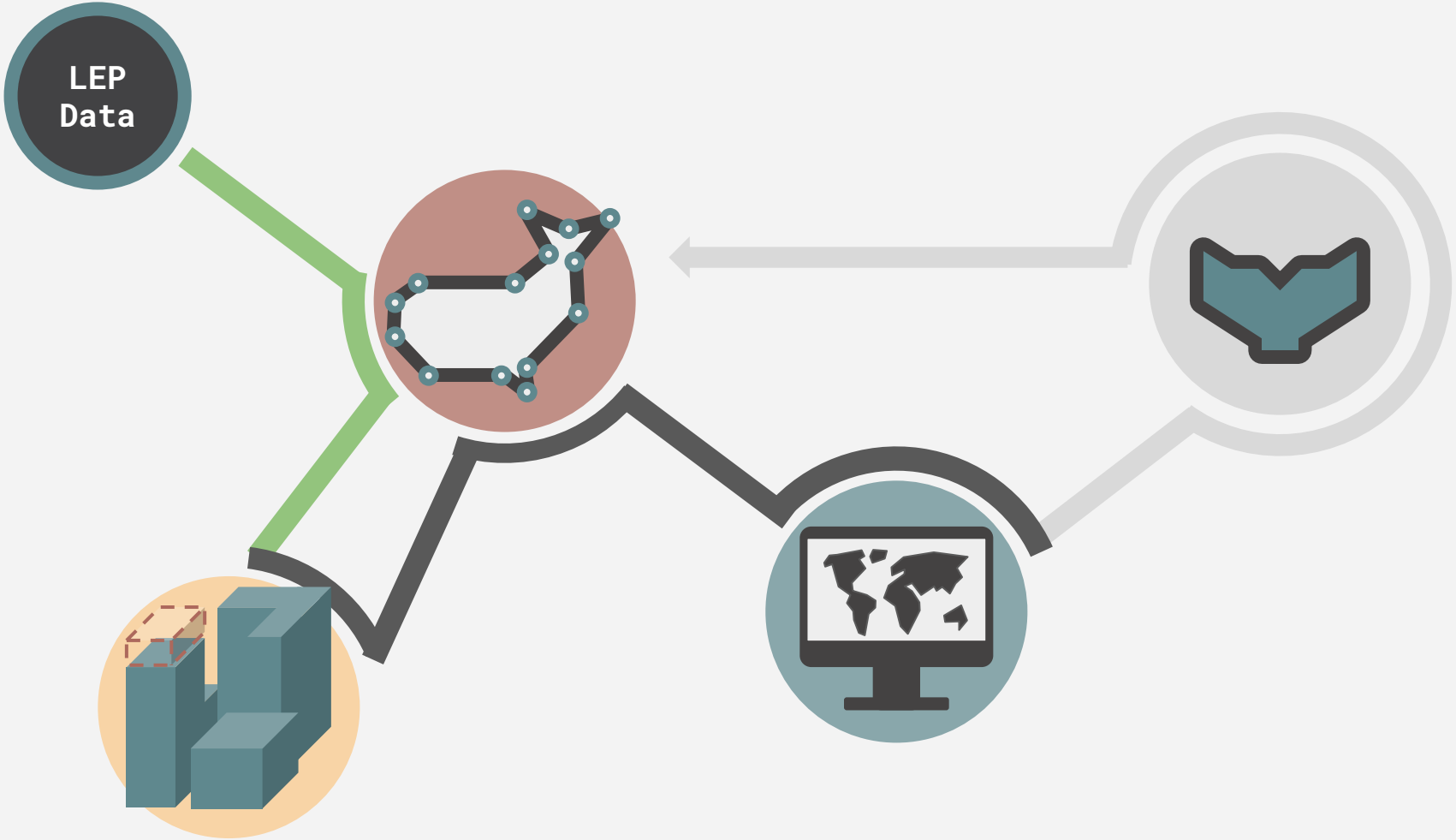
UPPD Conference 2018

HUMPBACK

Introducing and evaluating a GeoJSON constructor tool for Grasshopper

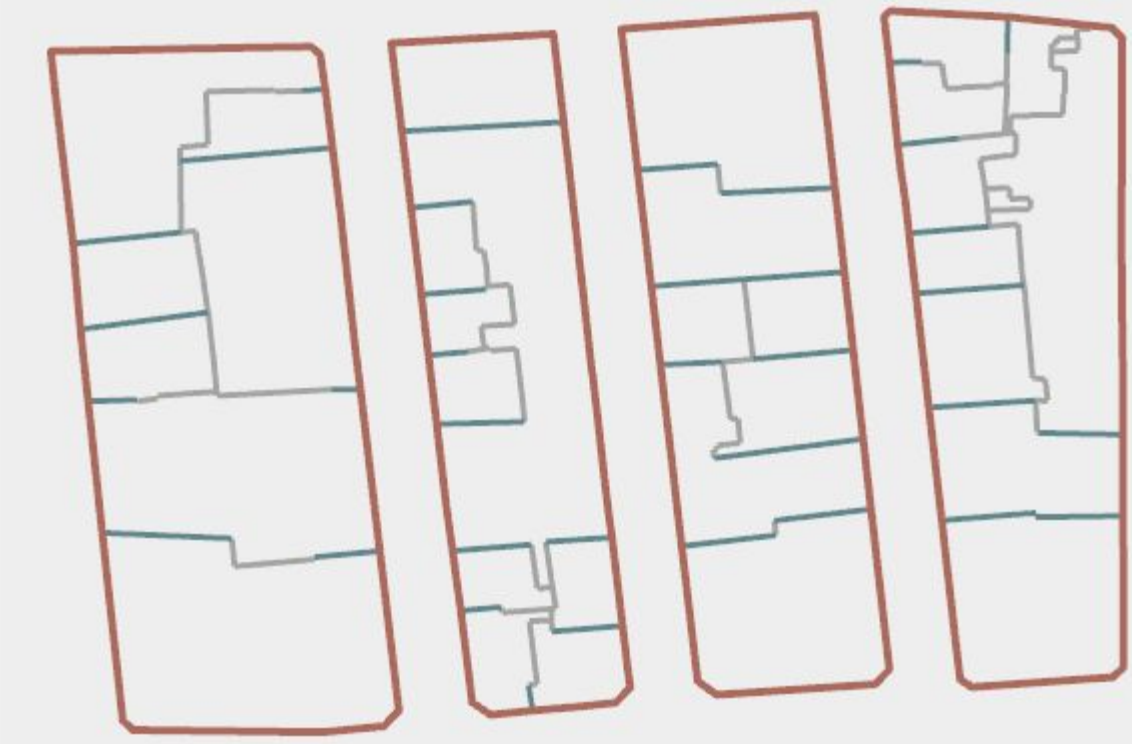


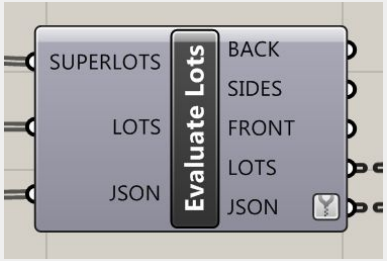
- Cadastral lots
- HOB
- FSR
- Solar planes
- Setback

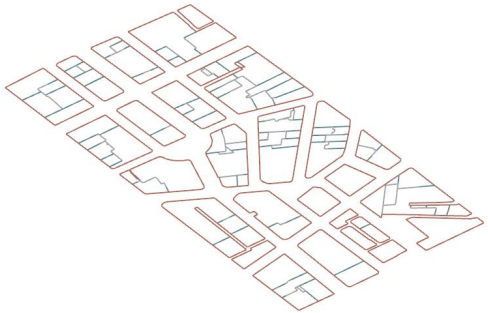

LEP
Data

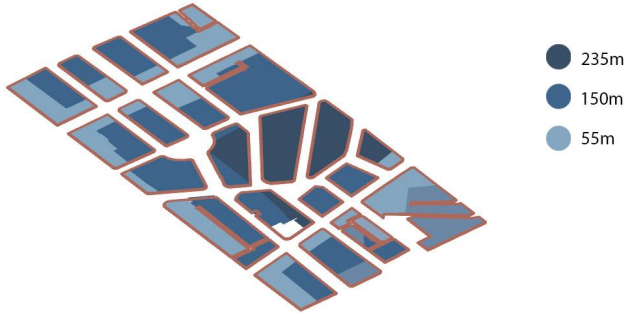
cadastral lots

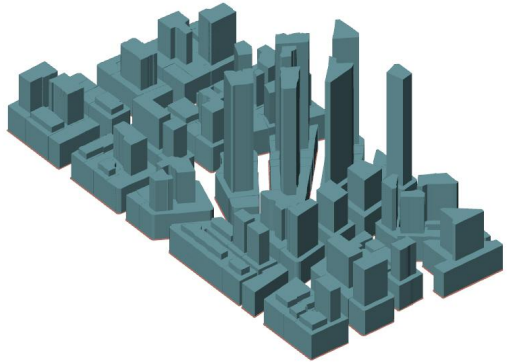
data

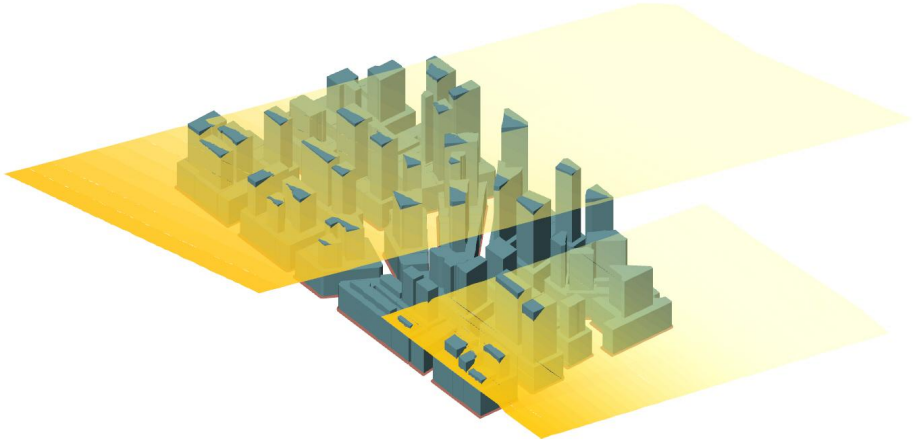


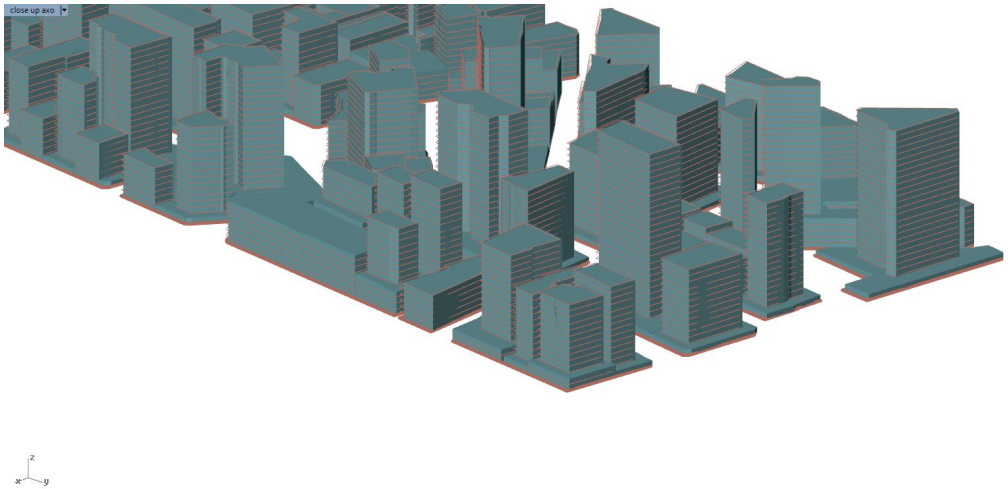

SUPERLOTS
LOTS
JSON
Evaluate Lots
BACK
SIDES
FRONT
LOTS
JSON

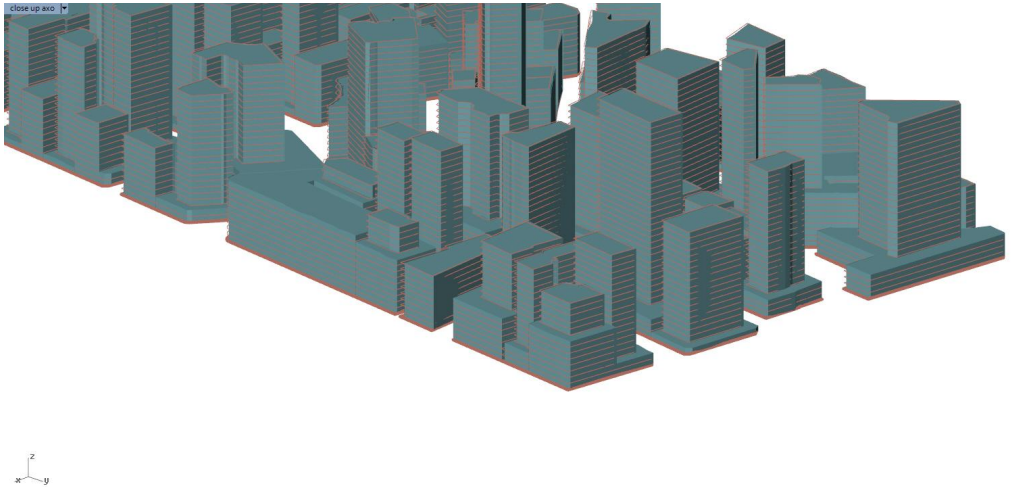



235m
150m
55m






close up axo
z
x
y


close up axo
z
x
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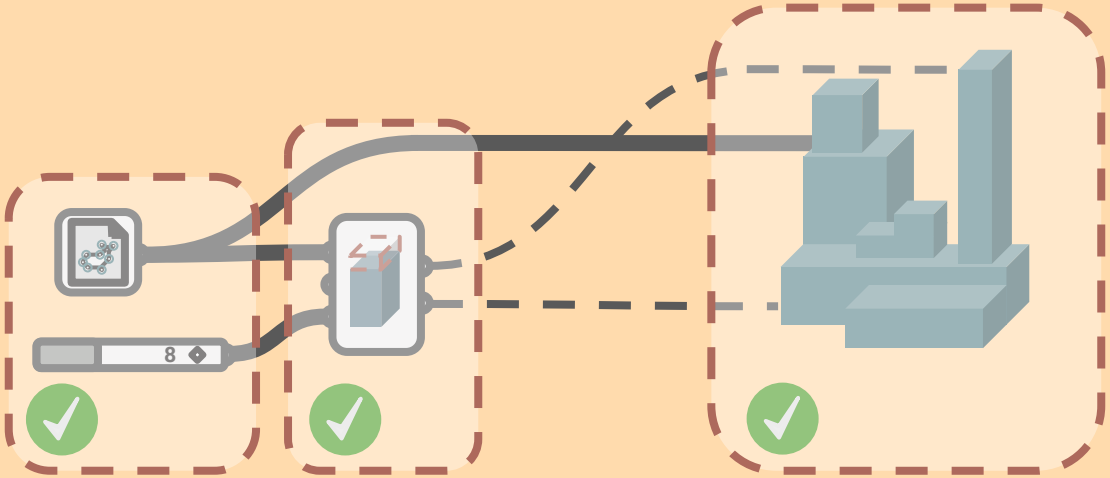

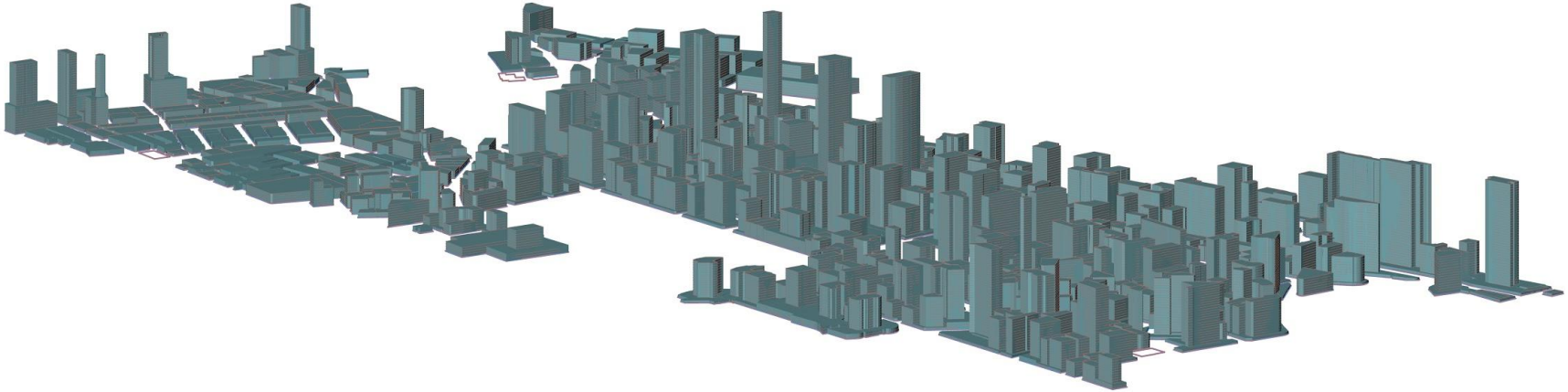

Quick stats

	A	B	C	D	E	F	G
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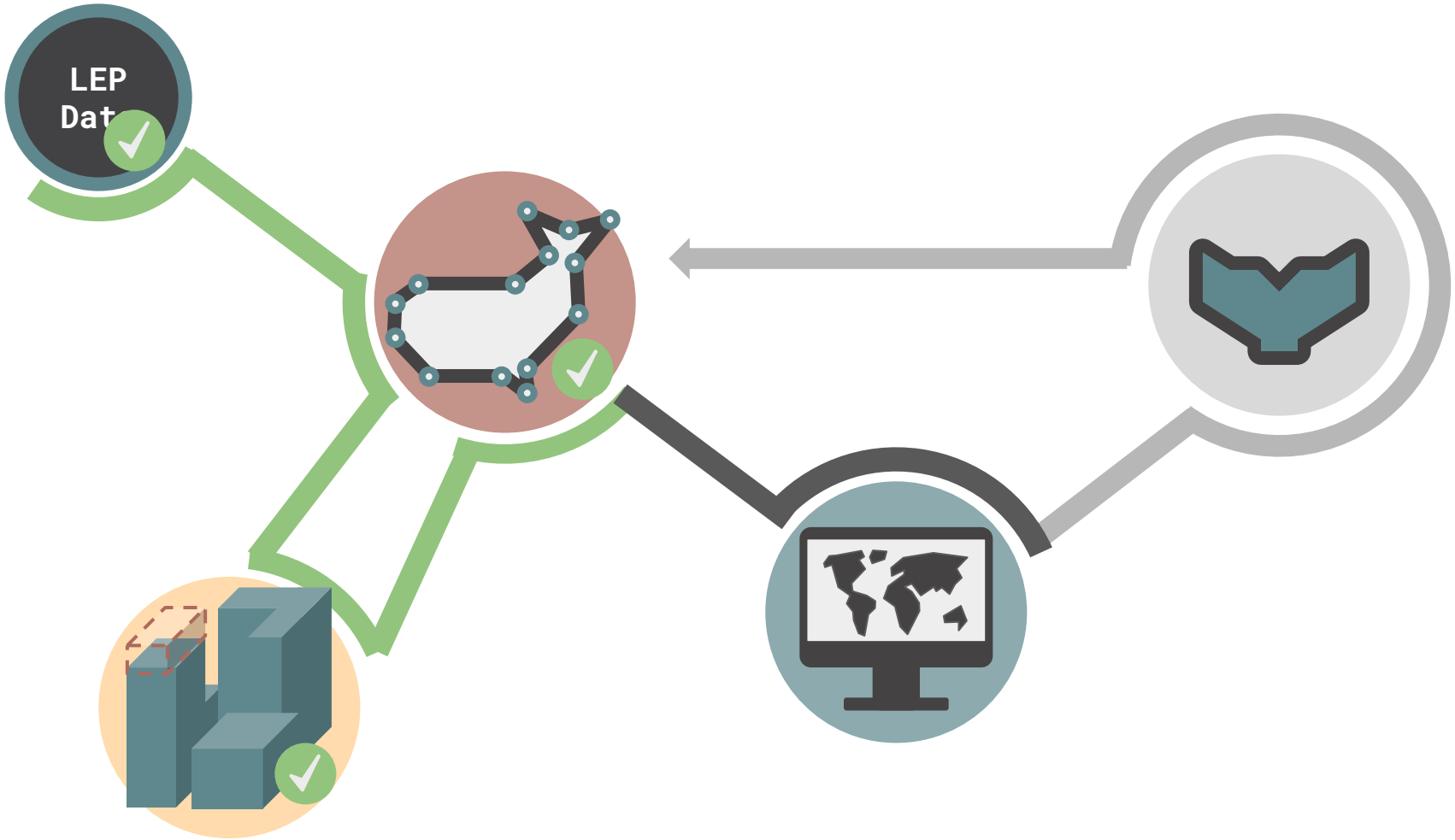
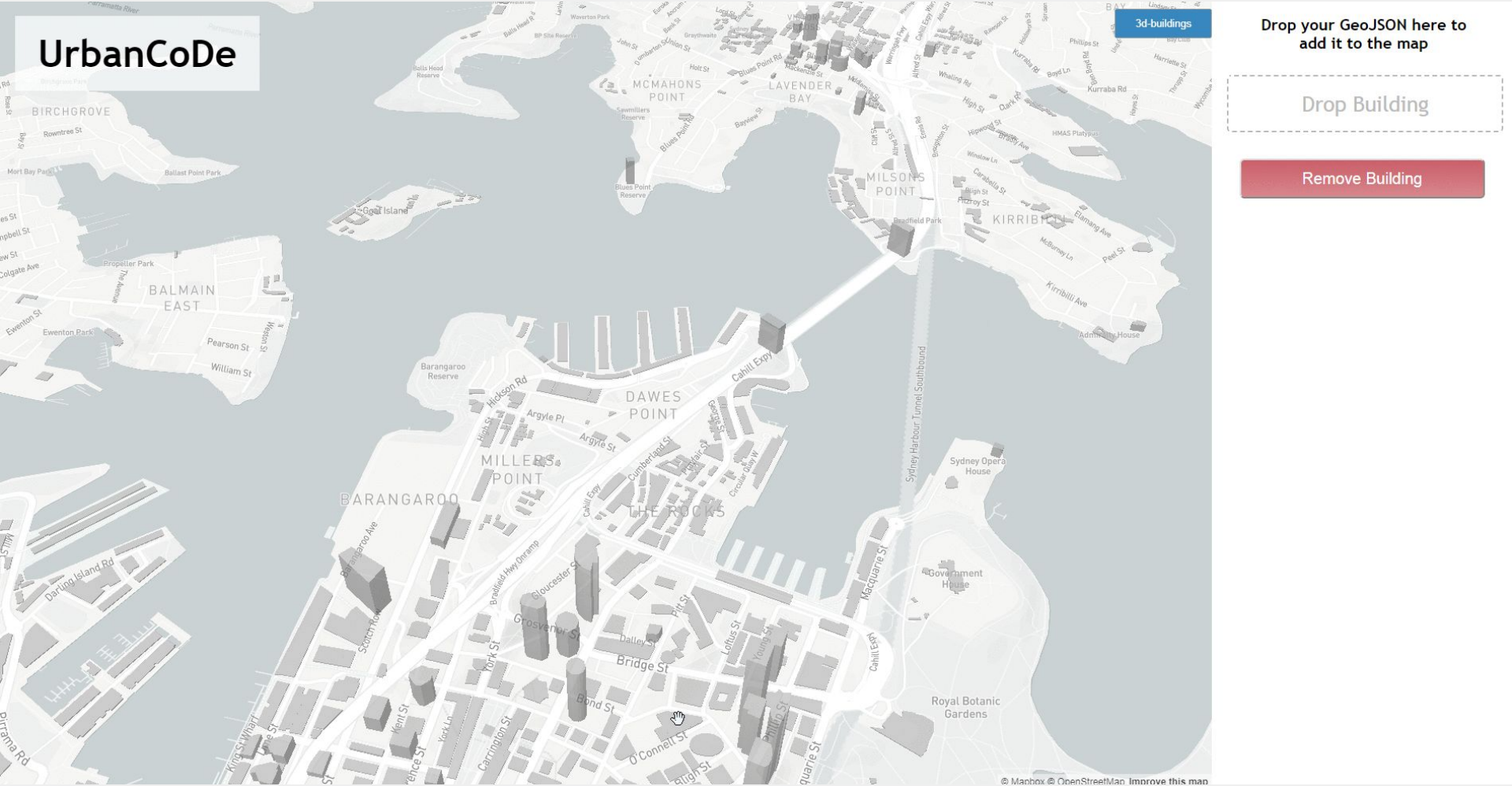
3	{0;1}	22460	17968	10781	7187	135	205
4	{0;2}	4946	3957	2374	1583	30	45
5	{0;3}	2460	1968	1181	787	15	22
6	{0;4}	8025	6420	3852	2568	48	73
7	{0;5}	24026	19221	11533	7688	144	220
8	{0;6}	6098	4878	2927	1951	37	56
9	{0;7}	6373	5098	3059	2039	38	58
10	{1;0}	3463	2770	1662	1108	21	32
11	{1;1}	7587	6070	3642	2428	46	69
12	{2;0}	259	207	124	83	2	2
13	{2;1}	6437	5150	3090	2060	39	59
14	{2;2}	1485	1188	713	475	9	14

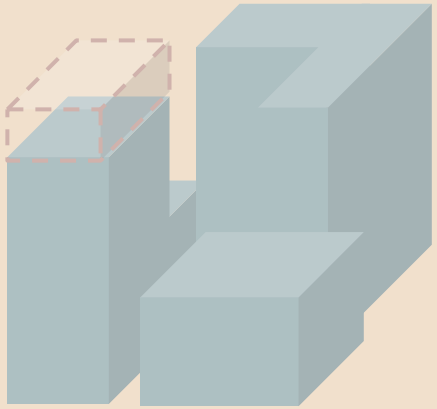
Facade Generation


LEP
Dat

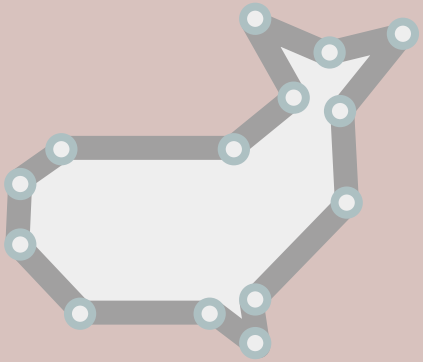

UrbanCoDe
3d-buildings
Drop your GeoJSON here to add it to the map
Drop Building
Remove Building
BIRCHGROVE
BALMAIN EAST
MCMAHONS POINT
LAVENDER BAY
MILSONS POINT
KIRRIBILLI
DAWES POINT
MILLERS POINT
BARANGAROO
THE ROCKS
Goat Island
Barangaroo Reserve
Sydney Opera House
Government House
Royal Botanic Gardens
Sydney Harbour Tunnel Southbound
Bradfield Park
Ballast Point Park
Propeller Park
Ewenton Park
Darling Island Rd
Pirrama Rd
Cahill Expy
Bridge St
Bond St
O'Connell St
Macquarie St
Kirribilli Ave
Kurraba Rd
Blues Point Rd
Blues Point Reserve
Sawmillers Reserve
Balls Head Reserve
Woverton Park
Pearson St
William St
Hickson Rd
Argyle Pl
Argyle St
Cumberland St
Gloucester St
Grosvenor St
Dalley St
Pitt St
Loftus St
Young St
Phillip St
Bradfield Hwy Onramp
Scotch Row
Kent St
York St
Carrington St
Bradfield Park
HMAS Platypus
Admiralty House
© Mapbox © OpenStreetMap Improve this map

Objective:

Develop an **open platform** for laws to be **found**, and developers to **work within**

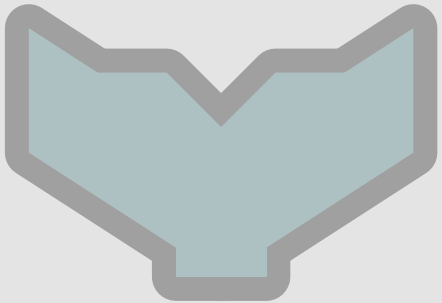


Beluga:
script



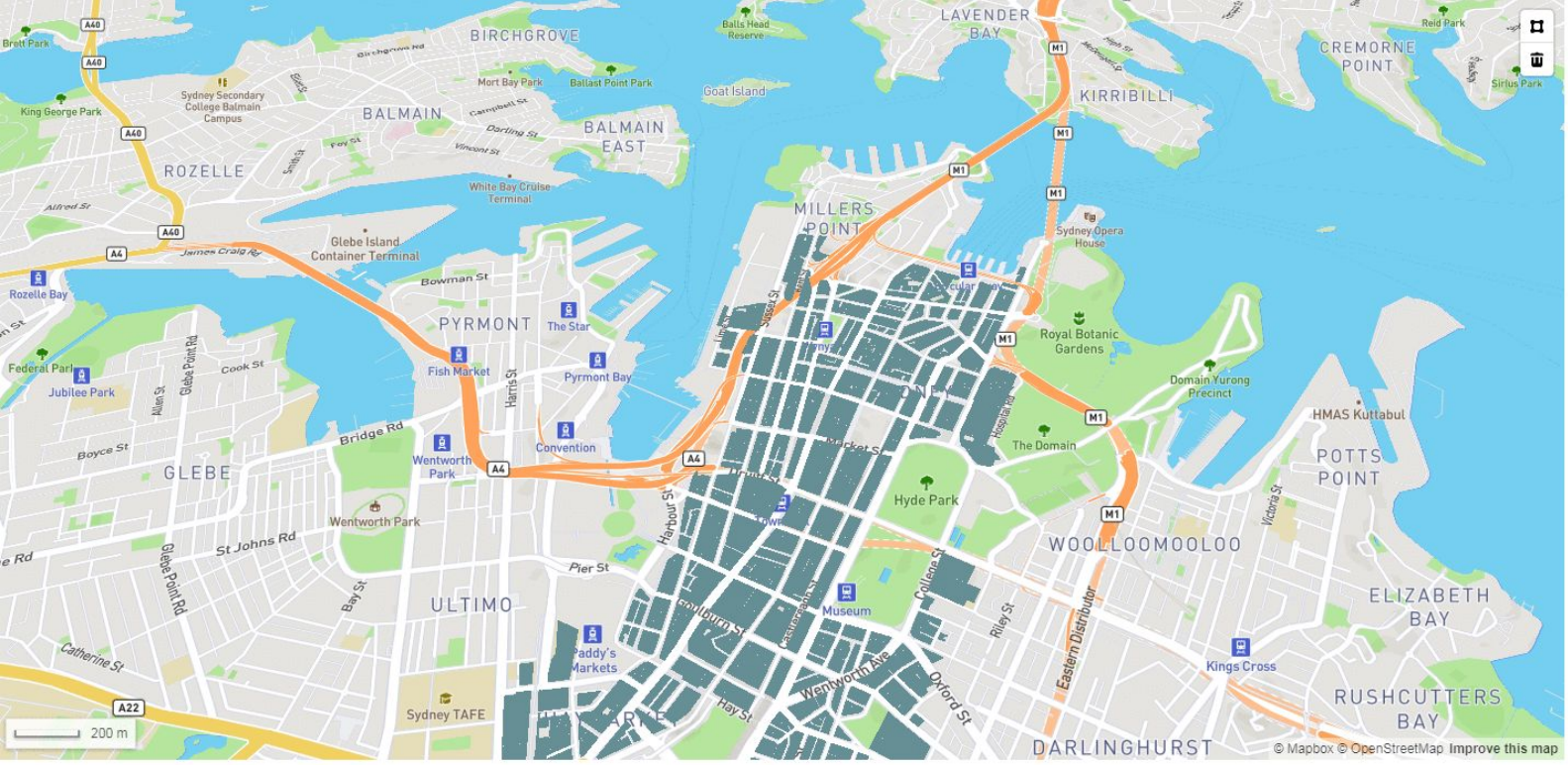
Humpback:
GIS translator

Dugong:
web app



Minke:
versioning tool

Dugong:
web app



Site Info

Lot number:
Council:
HOB:
FSR:
Land use:
Heritage:

Feasibility Study

Height of Building:

0

Levels of Building:

0

FSR:

0

Gross Floor Area (GFA):
Gross Building Area (GBA):

Dugong

SELECT SITE

Site Envelope Transparency

0.5

EXTRUDE SELECTED

Height

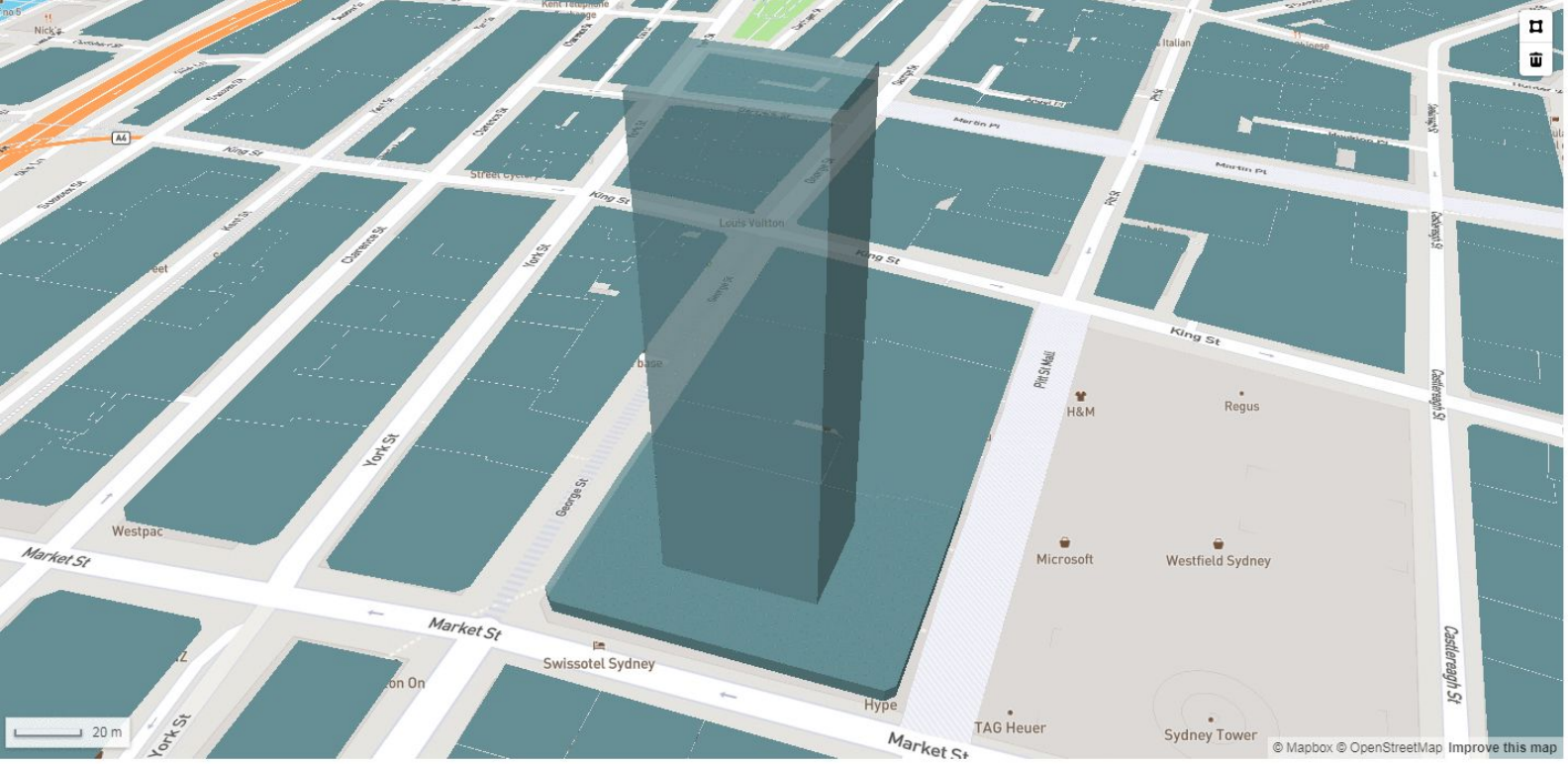
0

Base Height

0

Colour Picker

SAVE BUILDING



Dugong

SELECT NEW SITE

Site Envelope Transparency

0.74

EXTRUDE SELECTED

Height

0

Base Height

0

Colour Picker

SAVE BUILDING

Site Info

Lot number: 128
Council: City of Sydney
HOB: 130
FSR: 8
Land use: 70% resi, 30% comm
Heritage: yes

Feasibility Study

Height of Building:

0

Levels of Building:

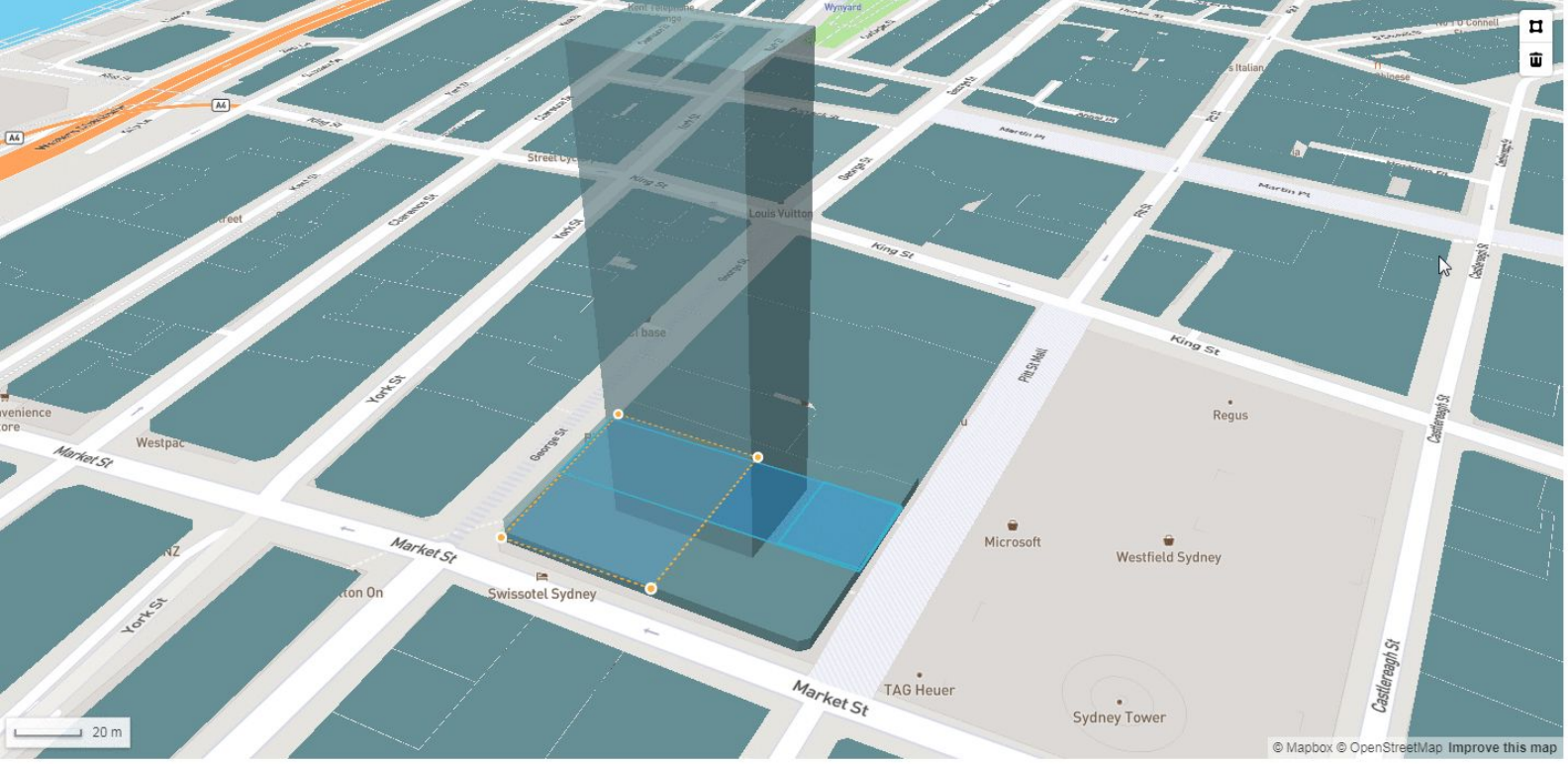
0

FSR:

0

Gross Floor Area (GFA):

Gross Building Area (GBA):



Dugong

SELECT NEW SITE

Site Envelope Transparency

0.64

EXTRUDE SELECTED

Height

0

Base Height

0

Colour Picker

SAVE BUILDING

Site Info

Lot number: 128
Council: City of Sydney
HOB: 130
FSR: 8
Land use: 70% resi, 30% comm
Heritage: yes

Feasibility Study

Height of Building:

0

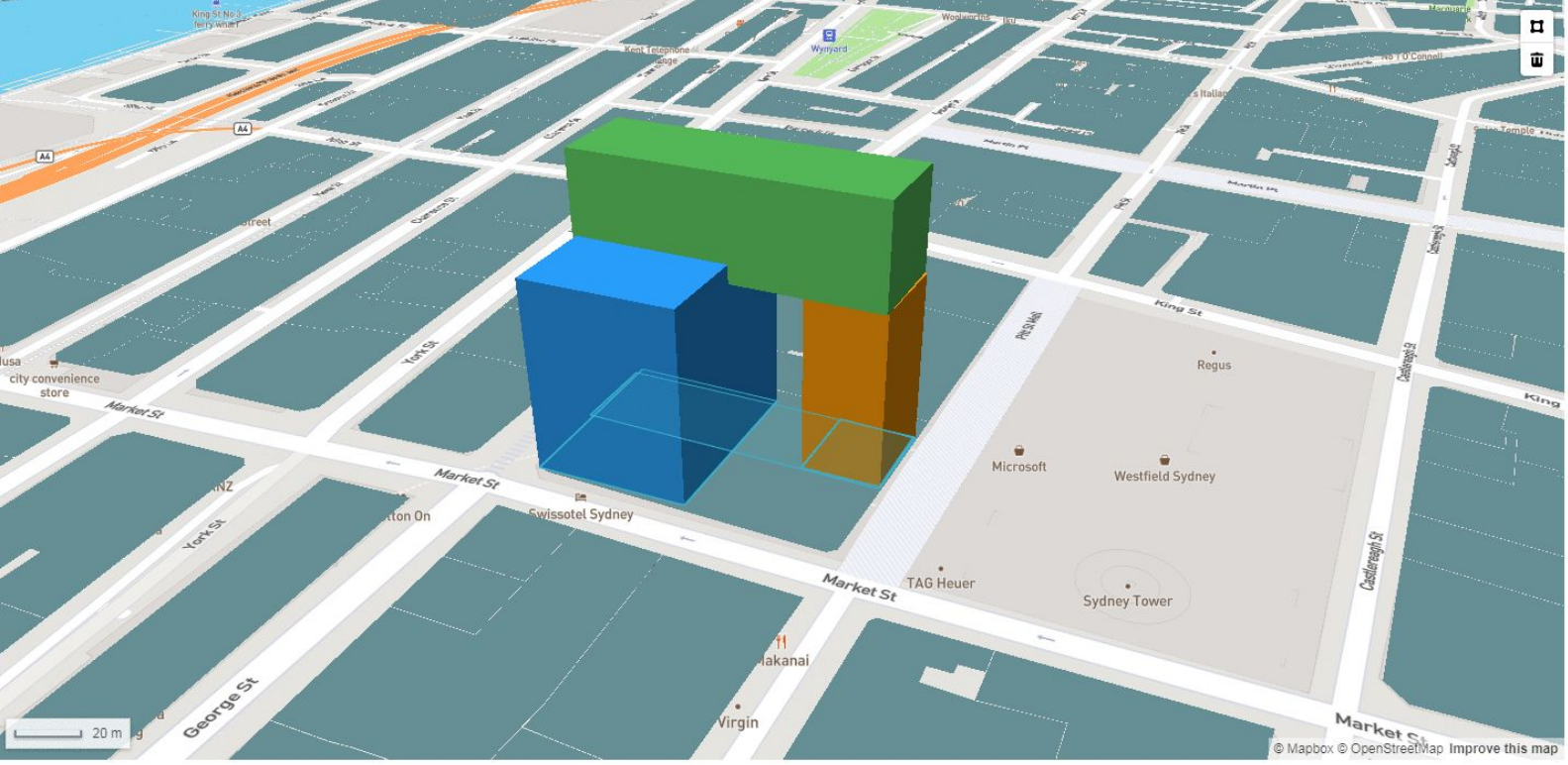
Levels of Building:

0

FSR:

0

Gross Floor Area (GFA): 0m2
Gross Building Area (GBA): 0m2



Site Info

Lot number: 128
Council: City of Sydney
HOB: 130
FSR: 8
Land use: 70% resi, 30% comm
Heritage: yes

Feasibility Study

Height of Building:

57
Levels of Building:

19
FSR:

15.27
Gross Floor Area (GFA): 132145.95m2
Gross Building Area (GBA): 105716.76m2

Dugong

SELECT NEW SITE

Site Envelope Transparency

0

EXTRUDE SELECTED

Height

57

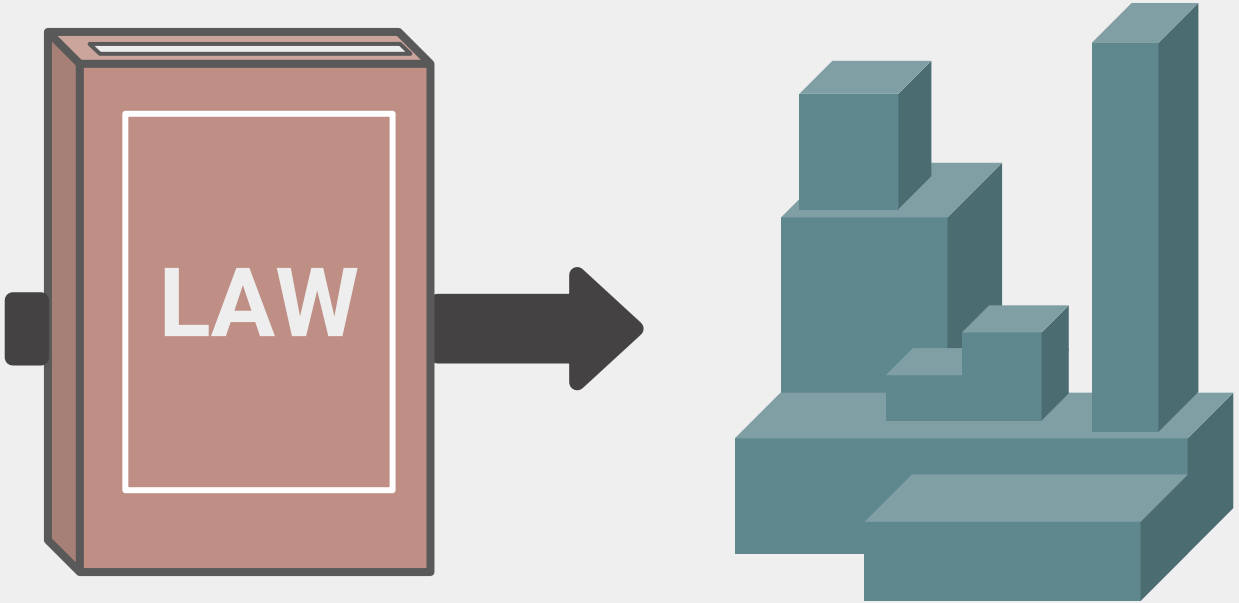
Base Height

0

Colour Picker

SAVE BUILDING

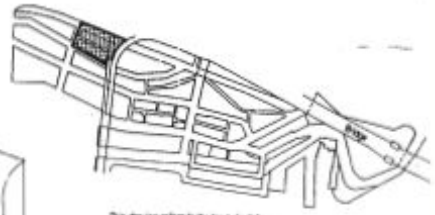
https://gist.github.com/2013fa1ec0c1339260b


LAW

I, David A. Hay, Minister for Local Government and Minister for Planning, being the minister responsible for administering the Sydney Cove Redevelopment Authority Act 1968 hereby, pursuant to Section 17 of that Act, approve the variation to the approved scheme evidenced by this control drawing.

David A Hay

Date: 19/12/88



This drawing refers to the land shaded

LEGEND

SITE BOUNDARY

EASEMENT

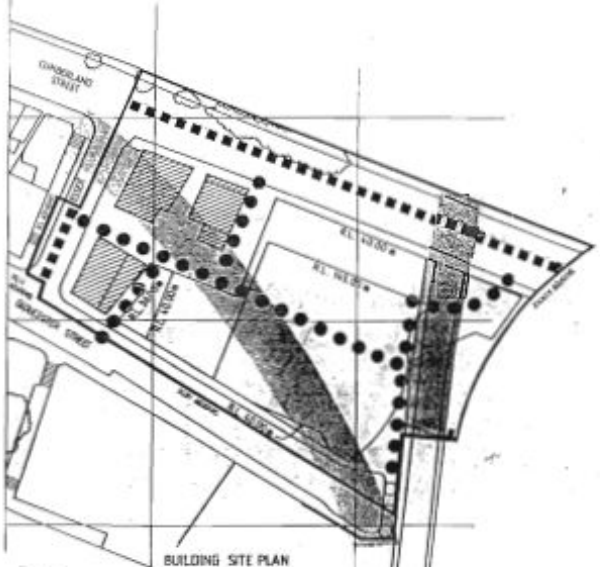
HISTORIC BUILDINGS

PEDESTRIAN ROUTE

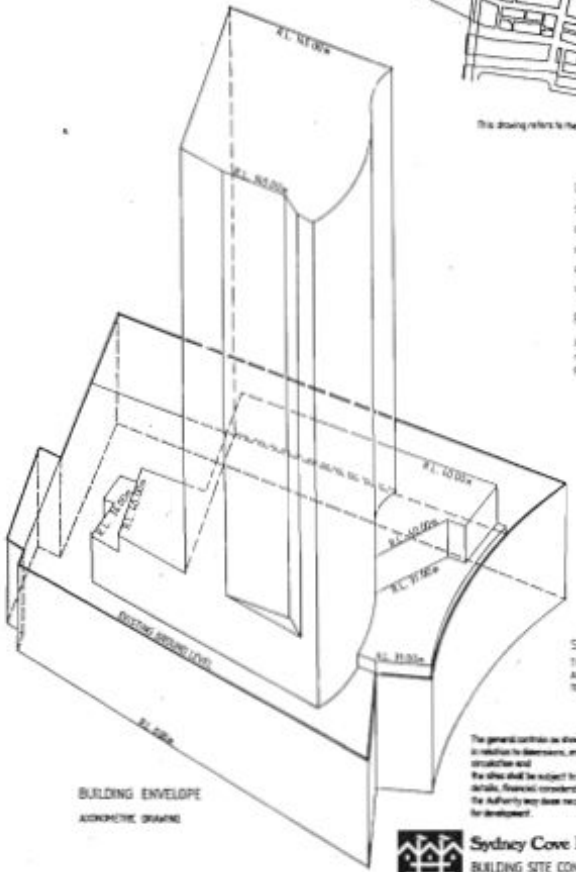
VEHICLE ROUTE

PERMITTED USES

RESIDENTIAL/HOTEL with ancillary bars, restaurants, shops, function rooms, and parking facilities.



BUILDING SITE PLAN



BUILDING ENVELOPE

AXONOMETRIC DRAWING

SPECIAL NOTE

THE MAXIMUM GROSS BUILDING AREA ABOVE GLOUCESTER STREET LEVEL IS NOT TO EXCEED 62,000 SQUARE METRES.

The general controls as shown on this drawing are subject to refinement of detail in relation to dimensions, entitlements, passages, open spaces and aspects of circulation and

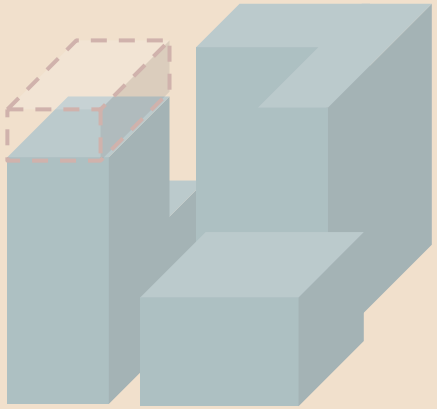
the sites shall be subject to such further conditions in relation to architectural details, financial considerations, staging and timing and system of approvals as the Authority may deem necessary and which may issue prior to the sites being offered for development.

Sydney Cove Redevelopment Authority

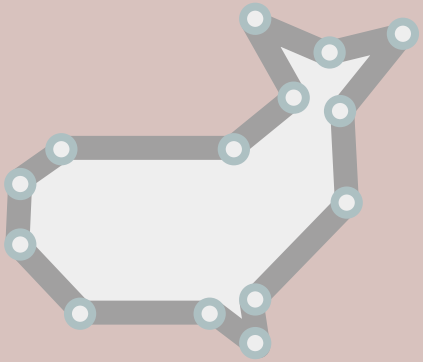
BUILDING SITE CONTROL DRAWING XLI (1)

30 METRES

This drawing forms part of the scheme which, subject to the approval of the Minister, will be the approved scheme under Part IV of the Sydney Cove Redevelopment Authority Act 1968.

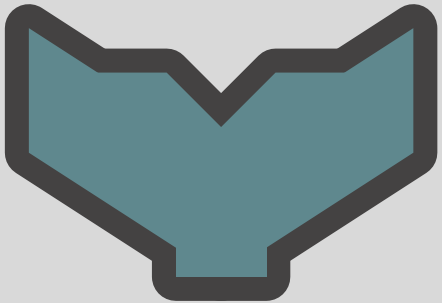


Beluga:
script

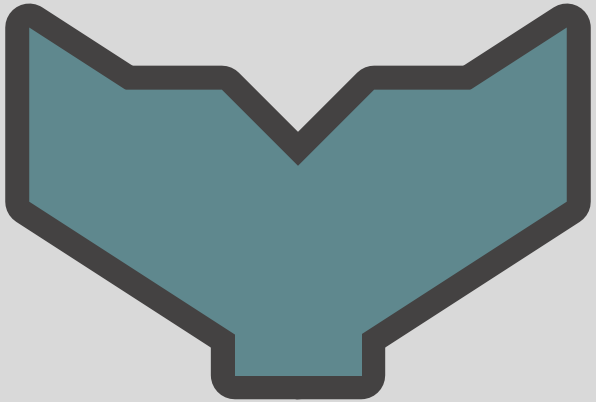


Humpback:
GIS translator

Dugong:
web app

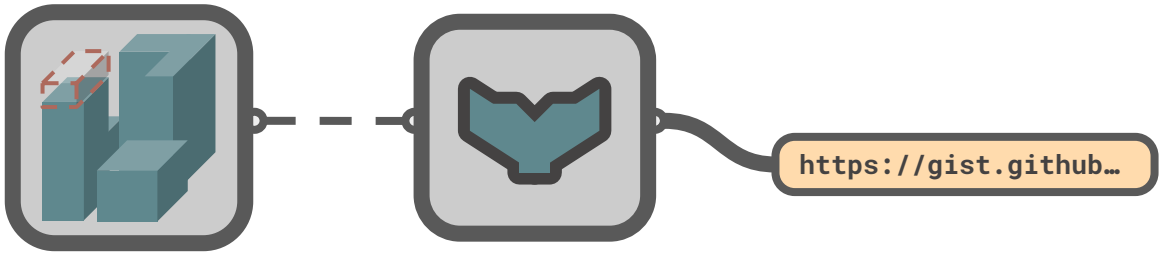


Minke:
versioning tool

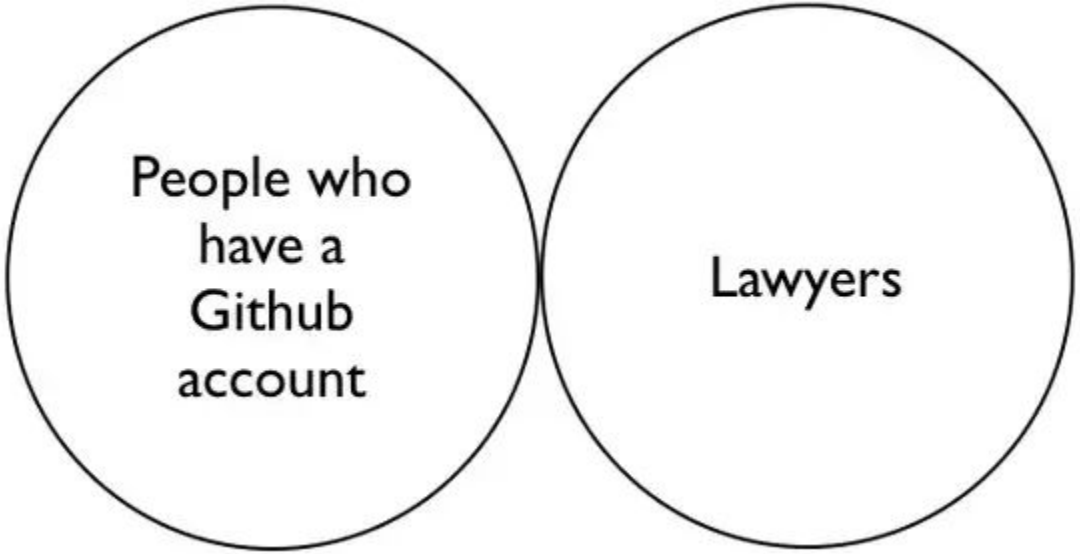


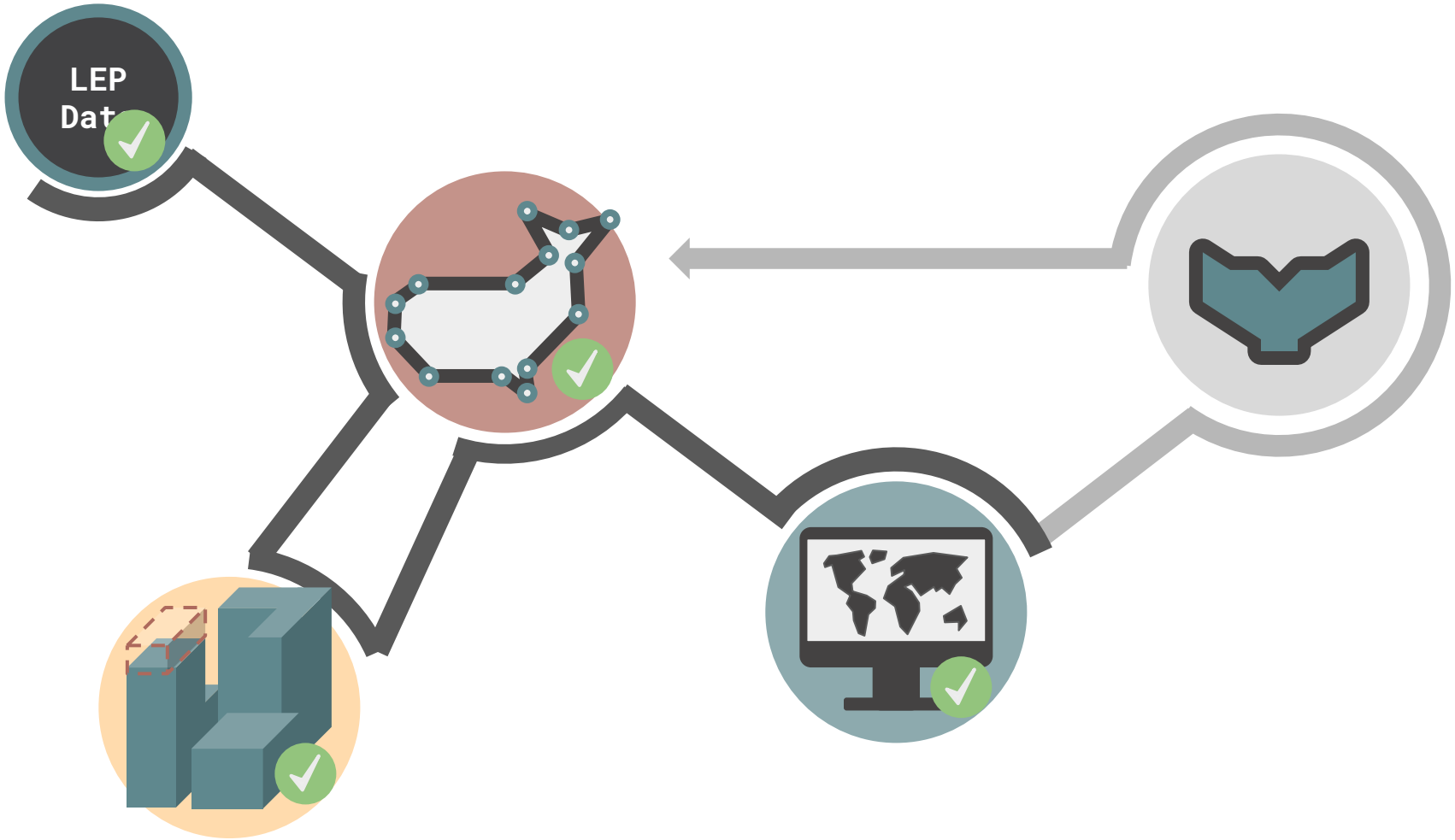
Minke:
versioning tool

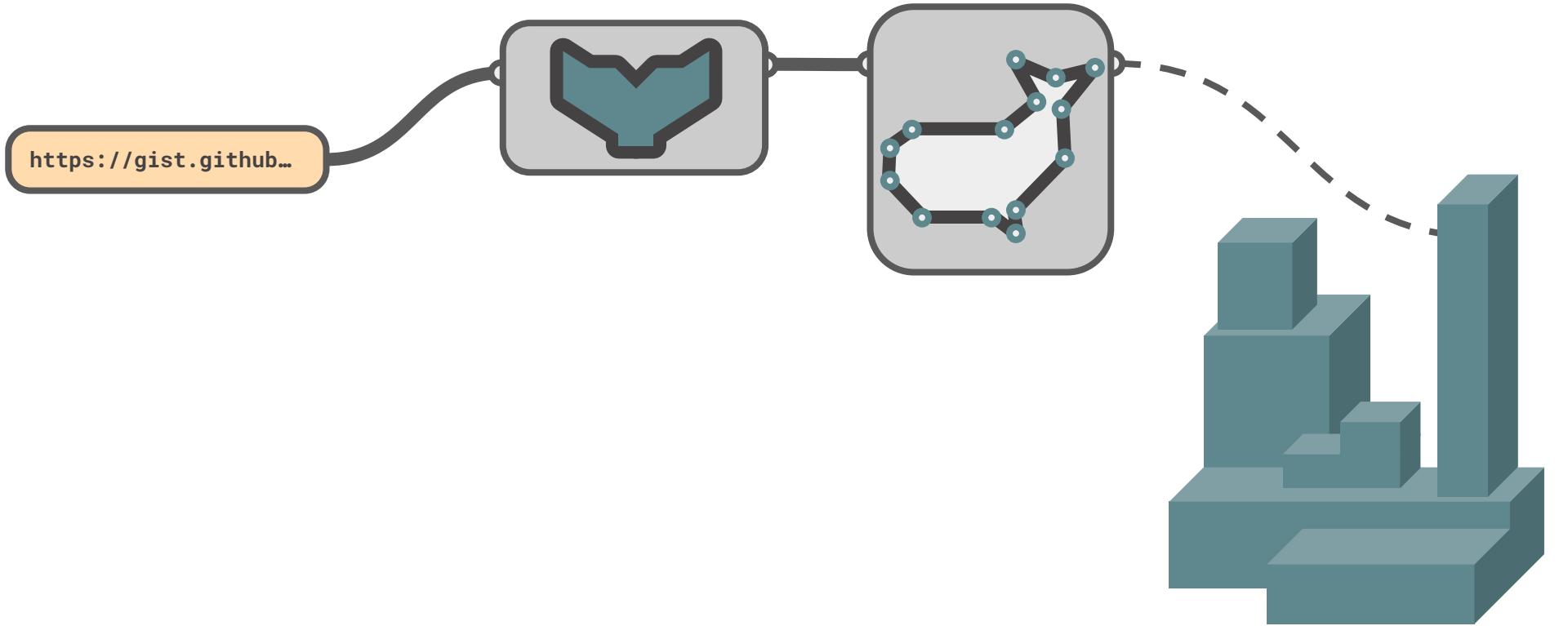
Versioning of the Law

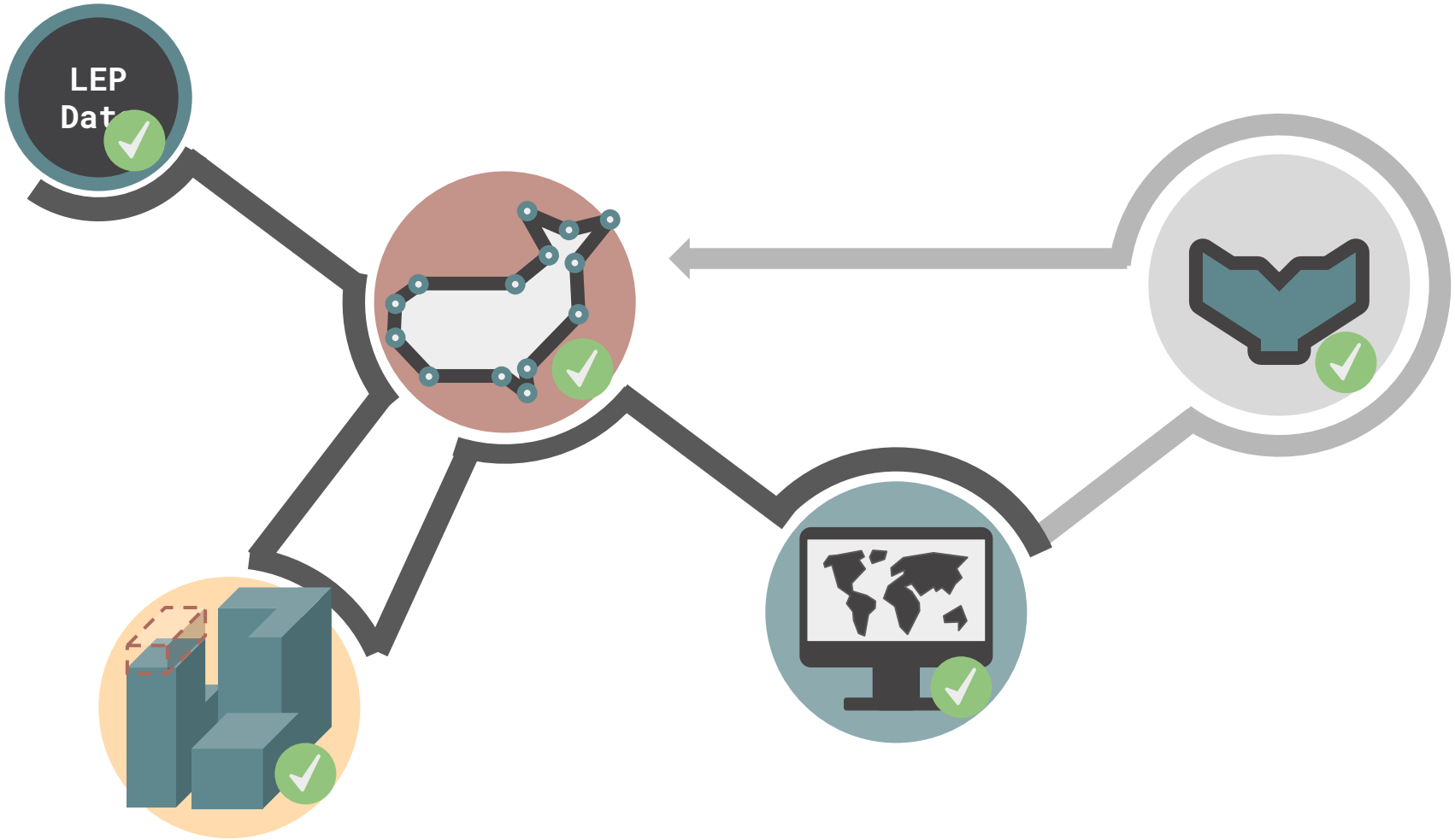

https://gist.github…

Why hasn't version control already been adopted in Law?




LEP
Dat


https://gist.github…


LEP
Dat

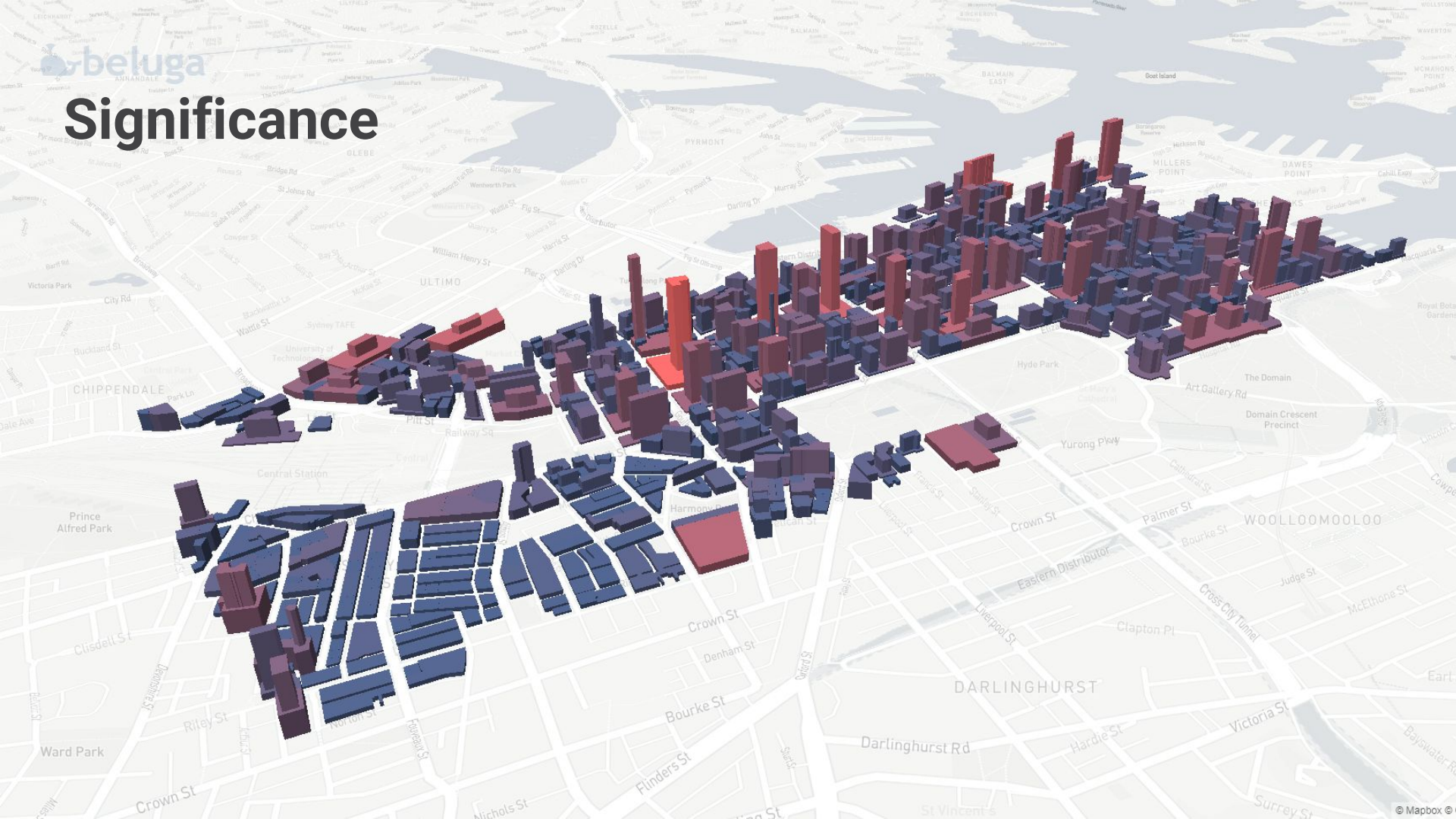
Addressing the Objectives

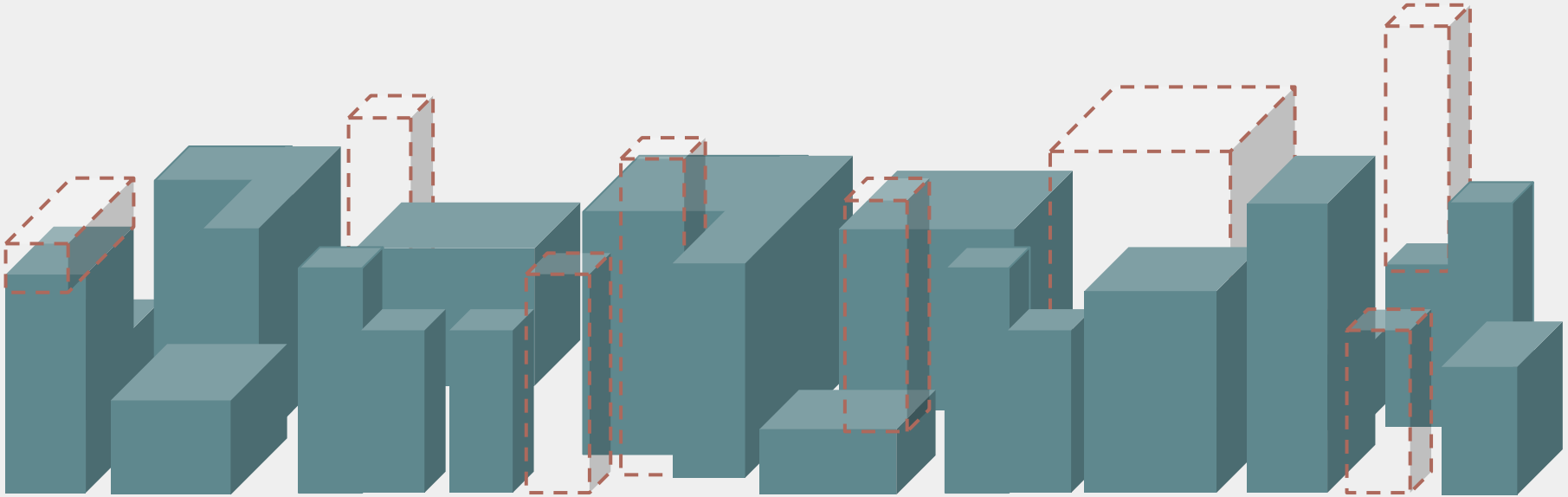
Open data can help inform better urban planning decisions

Web applications can be a tool to promote computational techniques

Streamline testing and simulation of new urban schemes

Significance



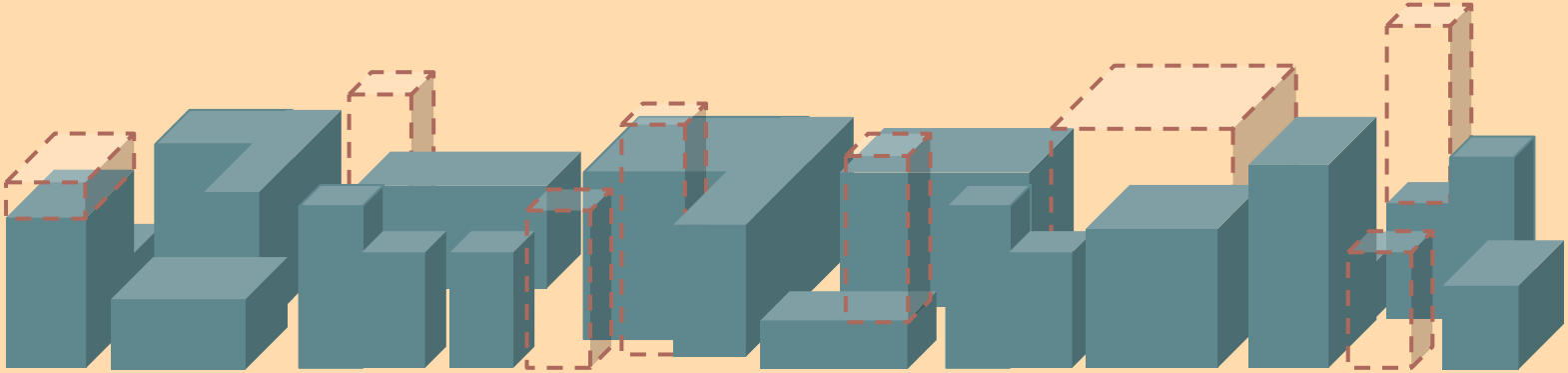


“In the longer run and for wide-reaching issues, more creative solutions tend to come from imaginative interdisciplinary collaboration.”

Robert J. Shiller

UrbanCoDe
Drop your GeoJSON here to add it to the map
Drop Building
Remove Building

Adjudicating by Algorithm

Scripting building regulations to generate permissible forms

Creating a web platform for interaction with the law