1. Land reclamation in Singapore: Tuas area

<u>Georeferencing</u>

- ❖ Choice of base map layer: OpenLayers Google Streets
- ❖ Choice of CRS: 3857
- ❖ Multiple points (>15) are made for each georeferencing of map to ensure map is properly stretched, and particularly more at Tuas area

<u>Vector creation</u>
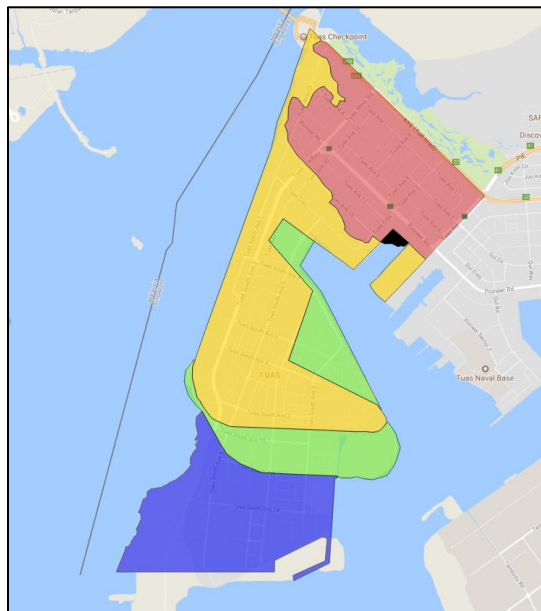
- ❖ Individual vector layers were made for each addition/removal or land in each year lapse

Surface area calculation

❖ Surface area is in sqm, will be translated to sqkm in map legend

Map creation

❖ Need to extend the map borders to the full page extent due to OpenLayers bug

2. Hydrological analysis: Kent Ridge catchment

2.1 Land use visualisation

<u>Shapefile creation</u>

❖ Choice of base map layer: OpenLayers Google Streets and Google Satellite
❖ Choice of CRS: 32648 (following CRS of Kent_Ridge_Catchment_Boundary)
❖ 150 words on approach:

In digitizing land use, there is a need to draw the boundaries of different land use to illustrate different capacity of surface flow based on runoff coefficients. GoogleSatellite was used so that an overview of the whole catchment, especially areas that are hard to access, can be identified, coupled with site survey to confirm the land use. In OpenStreetMap, it is impossible to differentiate grass and trees. OpenStreetMap and GoogleStreet were used to identify building names.

When establishing the vector layers, buildings, grass and paved areas were done first and merged, before using the Difference tool, in Toolbox SAGA, to create a new layer for trees, as it covers the biggest land mass. There is a need to ensure that the headers of the attribute table are the same. Colour choice of layers for better projection.

After using GoogleSatellite, GoogleStreets is used to complement it for eventual map generation instead of OpenStreetMap.
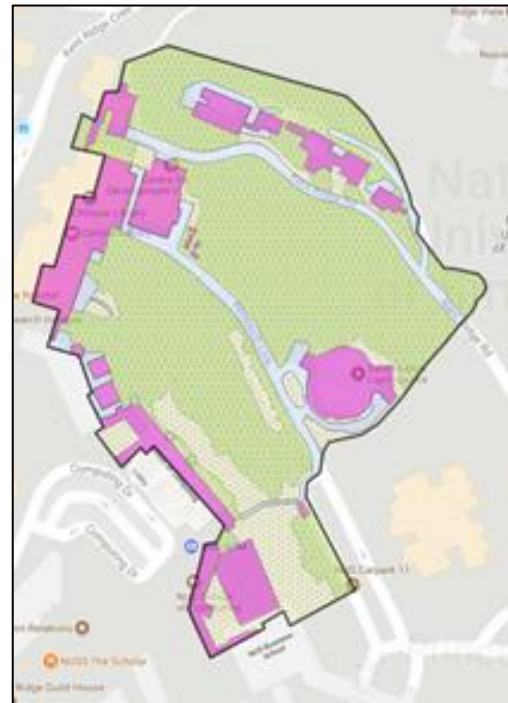
Attribute table

❖ Need to ensure that the headers of the attribute tables are the same

	id	Landuse	Runoff	Name
0	1	Bldg	0.90	CIT
1	2	Bldg	0.90	TMSI
2	3	Bldg	0.90	S2S
3	4	Bldg	0.90	S2S
4	5	Bldg	0.90	LT4
5	6	Bldg	0.90	CTRLIBANN
6	7	Bldg	0.90	CONTAINER
7	10	Bldg	0.90	CONTAINER
8	8	Bldg	0.90	CONTAINER
9	9	Bldg	0.90	CONTAINER
10	11	Bldg	0.90	CTRLIB
11	12	Bldg	0.90	AS6
12	13	Bldg	0.90	LT14
13	14	Bldg	0.90	LT15
14	15	Bldg	0.90	COM1
15	16	Bldg	0.90	COM2
16	17	Bldg	0.90	LT19
17	18	Bldg	0.90	TERRACE
18	19	Bldg	0.90	SLSS
19	20	Bldg	0.90	BUSOFF

	id	Landuse	Runoff	Name
0	1	Grass	0.30	SLSS
1	2	Grass	0.30	GARDEN
2	3	Grass	0.30	SLSS
3	4	Grass	0.30	CTRLIB
4	5	Grass	0.30	BEFBRG
5	6	Grass	0.30	SD_04
6	7	Grass	0.30	AFTBRG
7	8	Grass	0.30	COM2
8	9	Grass	0.30	COM1
9	10	Grass	0.30	S2S
10	11	Grass	0.30	TMSI
11	12	Grass	0.30	CIT
12	13	Grass	0.30	CTRLIBANN
13	14	Grass	0.30	CTRLIBANN
14	15	Grass	0.30	SLSS

	id	Landuse	Runoff	Name
0	1	Paved	0.75	KRR
1	2	Paved	0.75	S2SOFF
2	3	Paved	0.75	S2SOFF
3	4	Paved	0.75	TMSIOFF
4	5	Paved	0.75	CITOFF
5	6	Paved	0.75	RESEARCHLK
6	7	Paved	0.75	BRIDGE
7	8	Paved	0.75	CTRLIB
8	9	Paved	0.75	CTRLLIB
9	10	Paved	0.75	CTRLIB
10	12	Paved	0.75	AS6
11	13	Paved	0.75	LT
12	11	Paved	0.75	PAVEMENT

	id	Landuse	Runoff	Name
0	1	Trees	0.15	NORTH
1	2	Trees	0.15	CTRLIB
2	3	Trees	0.15	CTR
3	4	Trees	0.15	N1
4	5	Trees	0.15	SOUTH
5	6	Trees	0.15	N2
6	7	Trees	0.15	N3
7	8	Trees	0.15	S1
8	9	Trees	0.15	S2

Map creation

❖ Need to extend the map borders to the full page extent due to OpenLayers bug

Kent Ridge Landuse

Legend
Buildings (0.90)
Paved (0.75)
Grass (0.30)
Trees (0.15)
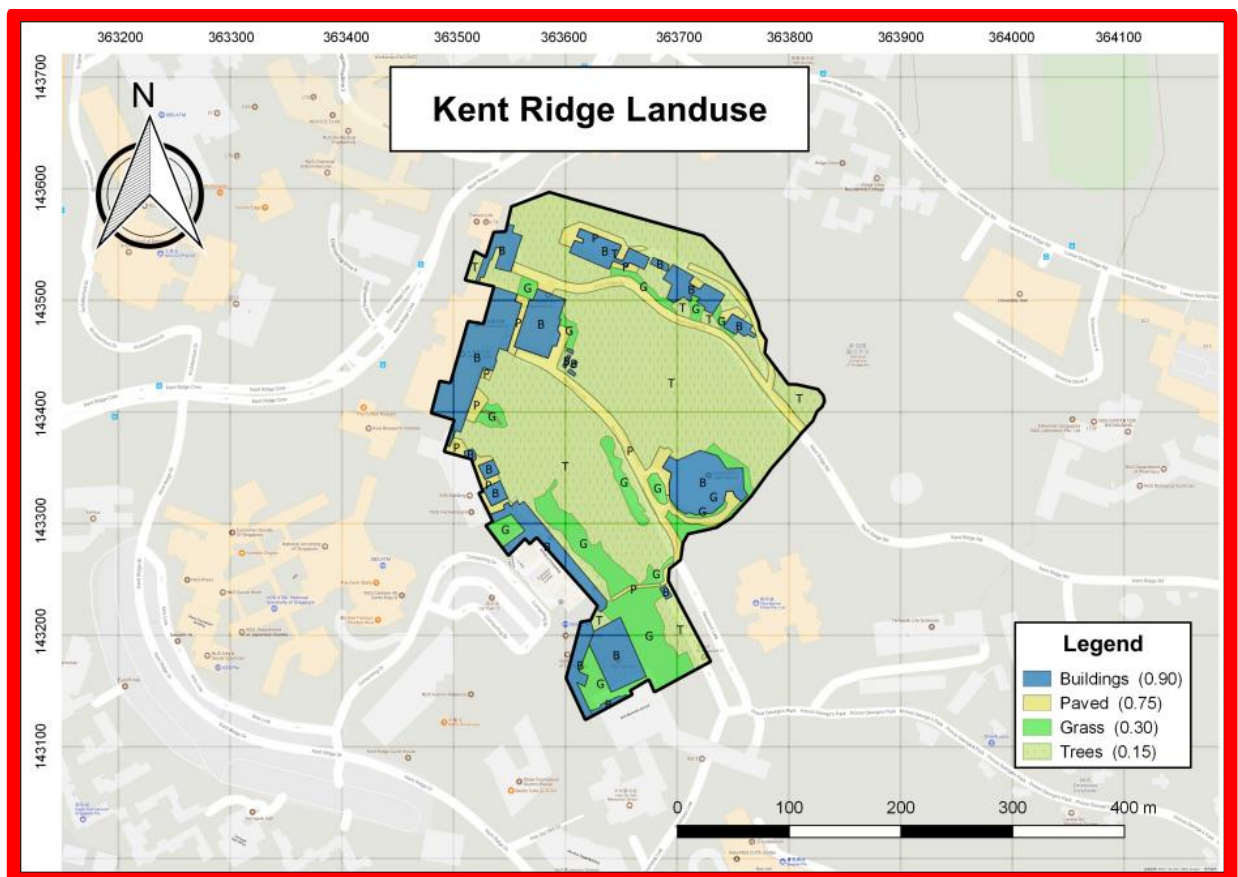
2.2 Rasterisation

<u>Merging of layers</u>

❖ To check attribute table after merging to ensure that all information are correctly transferred
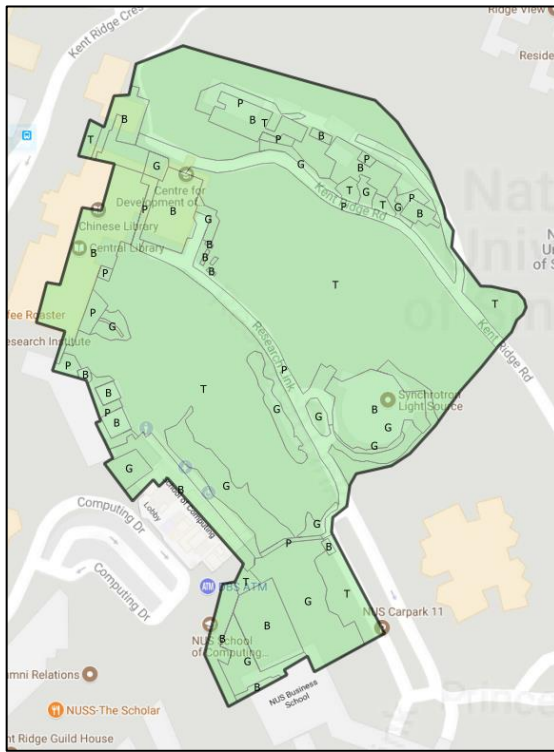
|	id	Landuse	Runoff	Name
0	1	G	0.30	SLSS
1	2	G	0.30	GARDEN
2	3	G	0.30	SLSS
3	4	G	0.30	CTRLIB
4	5	G	0.30	BEFBRG
5	6	G	0.30	SD_04
6	7	G	0.30	AFTBRG
7	8	G	0.30	COM2
8	9	G	0.30	COM1
9	10	G	0.30	S2S
10	11	G	0.30	TMSI
11	12	G	0.30	CIT
12	13	G	0.30	CTRLIBANN
13	14	G	0.30	CTRLIBANN
14	15	G	0.30	SLSS
15	1	B	0.90	CIT
16	2	B	0.90	TMSI
17	3	B	0.90	S2S
18	4	B	0.90	S2S
19	5	B	0.90	LT4
20	6	B	0.90	CTRLIBANN
21	7	B	0.90	CONTAINER
22	10	B	0.90	CONTAINER

<u>Rasterisation</u>

❖ 10mx10m is equals to 37950 pixels by 37950 pixels

❖ Remove the zero value areas by changing the colour of zero value and introducing opacity
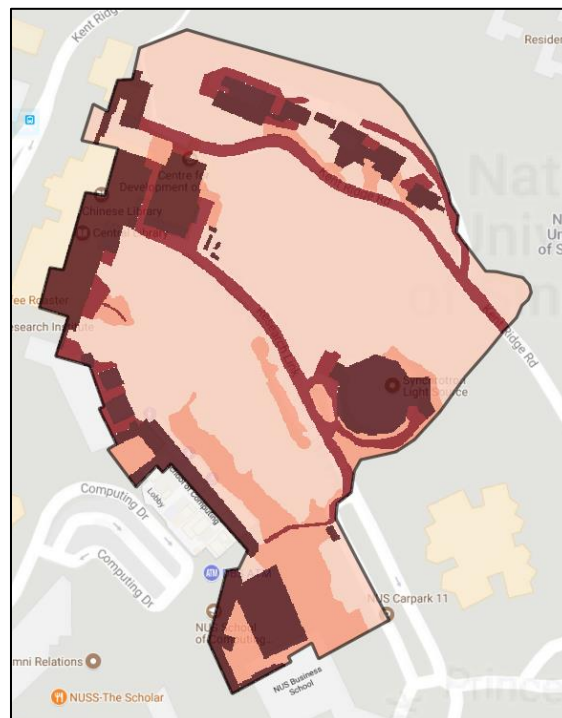
Map creation

❖ Need to extend the map borders to the full page extent due to OpenLayers bug
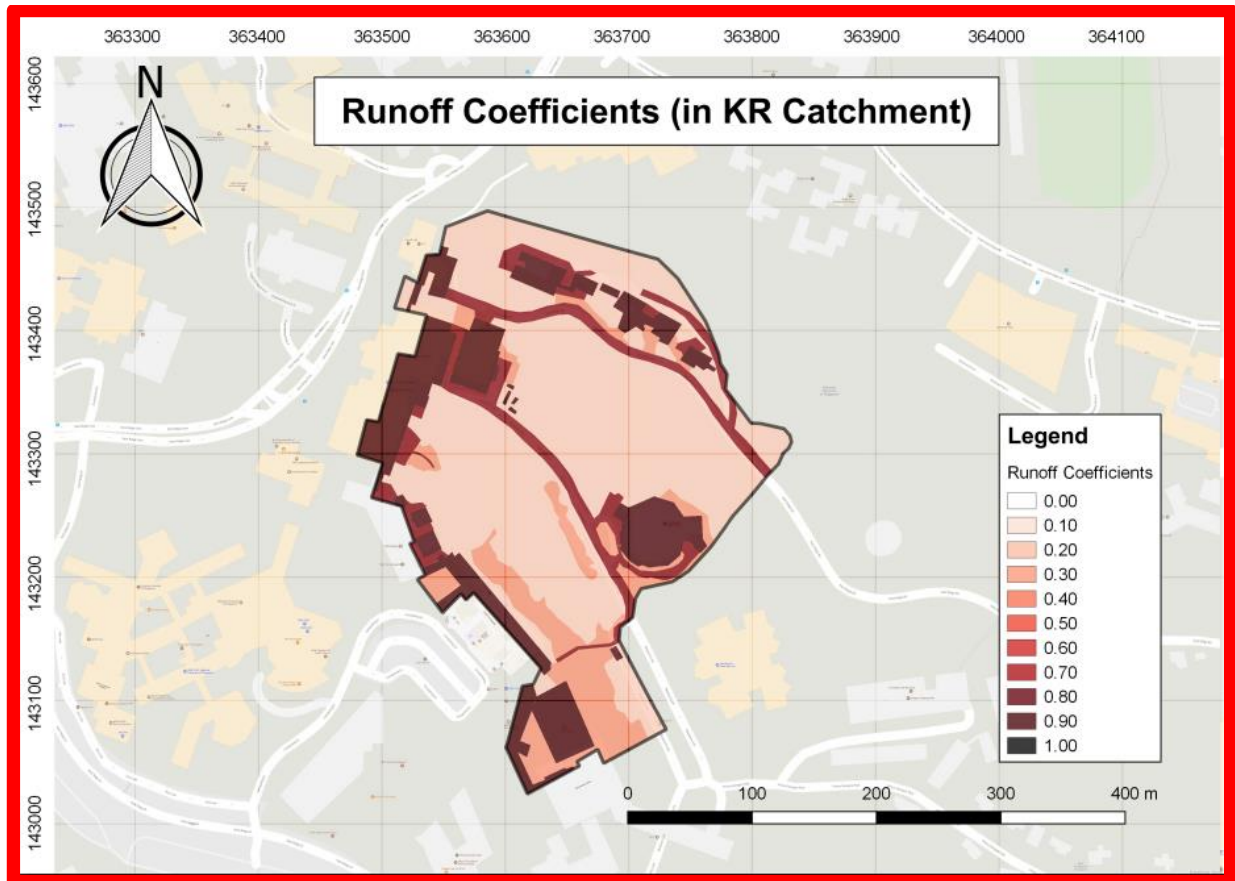
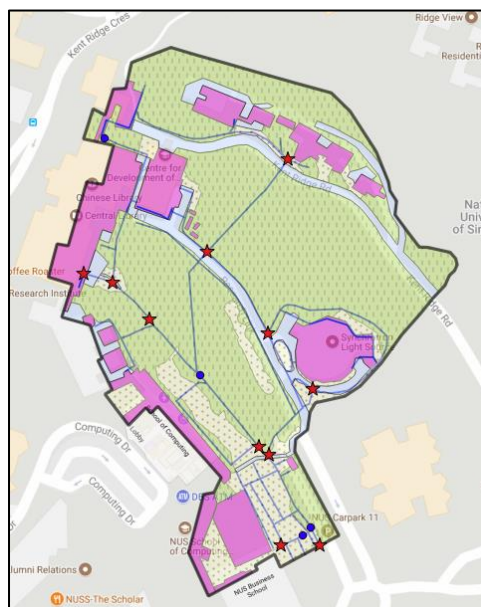## 2.3 Elevation digitisation

Generation of raster DEM and contours

❖ The raster and contours generated will go beyond the Kent_Ridge_Catchment_Boundary so there is a need to clip the difference away. During clipping, it is important to note that the input vector layer and the clip layer are on the same CRS. If not, simply save to the project CRS and perform the clip.
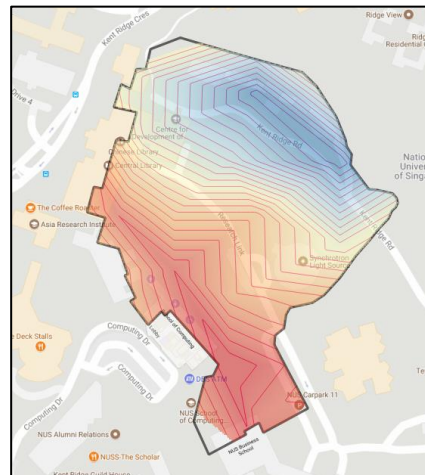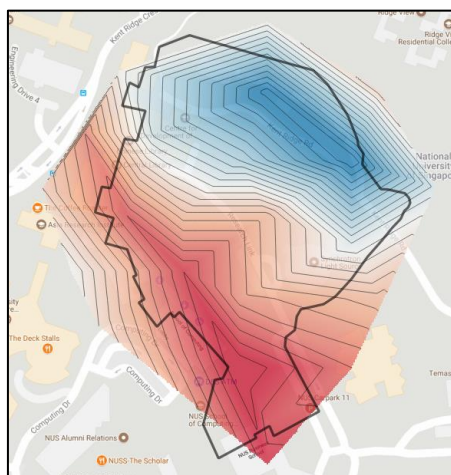
Map creation

❖ Need to extend the map borders to the full page extent due to OpenLayers bug

2.4 Buffer zoning

Import and buffer zone creation

❖ Only weirs were assigned buffer zones out of all the monitoring points, and weirs and flumes
were assigned different symbols.

Map creation

❖ Need to extend the map borders to the full page extent due to OpenLayers bug