

Appendix 1 Wellington Region Plan Enabled Development Capacity Modelling Methodology 2023

1. Overview

The HBA is a requirement of the National Policy Statement on Urban Development 2020 (NPS-UD).

The current Housing and Business Assessment (HBA) is the third HBA undertaken across councils within the Wellington urban environment. This HBA has been extended to also include Horowhenua, Masterton, Carterton and South Wairarapa District Councils – covering the full extent of the Wellington Regional Growth Framework.

The purpose of this document is to outline the methodology used to identify theoretical plan-enabled development capacity as part of the HBA process.

The methodology used to support this HBA builds on previous assessment processes. Councils continue to work together to share and refine the application of the processes supporting the HBA.

2. Methodology

Identifying theoretical plan enabled development capacity lies at the core of the HBA.

Modelling is used to identify the development capacity that is theoretically available under District Plan settings (plan enabled) for each property. This is then used to inform further economic feasibility work and ultimately comparison against residential and business demand.

Identification of theoretical development capacity is undertaken in three stages:

- Data Preparation – preparation of the underlying data in ArcGIS Pro.
- Procedural 3D Modelling – CityEngine is used to model District Plan rules.
- Further Analysis – Is undertaken in MS Excel to identify the amount of development capacity available and different residential and business outputs.

More detail for each of these steps is provided in the following discussion.

2.1 Data Preparation

Data is prepared in ArcGIS Pro to support 3D modelling of theoretical capacity. This includes compiling several datasets that provide information at property level – the basis of the assessment. The source data includes:

- District Plan information – land use zoning and physical constraints and overlays including heritage features, hazards and designations for all residential and business zones (including mixed use zones). This includes relevant rules and development settings for permitted, controlled and restricted discretionary activities.

- Rating information – capital value, land value, improvement value, existing dwellings and floorspace.
- Geospatial information – outline of existing buildings and cardinal direction of the street from the front boundary and development contributions.

This data is then used to produce two layers - one for comprehensive redevelopment and one for infill testing. The key difference between the layers is how they deal with existing buildings.

The comprehensive redevelopment layer does not recognise existing buildings and treats the site as if it were empty.

The infill layer contains the same information, but with all existing buildings removed from the spatial extent of the layer. This removal of buildings creates 'holes' on the site where existing buildings are located and thereby reduces the available footprint for development. The infill testing excludes buildings which have a floorspace less than 50m²; these buildings are often sheds or garages which are expendable.

2.2 Procedural 3D Modelling

The data is imported into CityEngine, for the purposes of undertaking 3D procedural modelling. Procedural modelling is a method which uses a customised rule file to undertake a series of tasks on any number of inputs. In relation to the current project, these tasks relate to the application of District Plan Rules, including setbacks, site coverages and building recession plane requirements.

In order to simplify modelling a number of assumptions and simplifications are made. This includes the provision for open space rules to be accommodated within the space where development on a site is not identified, in keeping with site coverage rules.

The procedural modelling is carried out in four steps:

- Import the underlying GIS layers (using a Digital Elevation Model (DEM)).
- Apply the user set parameters (District Plan Zones, rules, etc.).
- Run a range of tests and geometric operations to apply the District Plan Rules.
- Produce 3D models of what could be built on each site.

This produces a redevelopment and infill output. This includes a total theoretical capacity that can be achieved on each property within the District Plan rules – in the form of an envelope of developable space available.

The outputs contain combined details alongside a modelled capacity for each property. This includes a footprint area, total capacity, number of floors, and capacity by floor.

This information is then used to inform potential residential and business development scenarios.

2.3 Identifying different housing typology yields

A number of further calculations are used to identify potential housing scenarios and yields on each property.

The first step is for theoretical development capacity to remove any area that is not suitable for development. This is undertaken by overlaying constraint layers with scoring. Where cumulative overlays exceed a threshold, that area is identified as inappropriate to develop and is prorated into the theoretical capacity identified for the site.

The next step is for each property to identify its potential yield across small, medium and large sized development across housing, terrace and apartment typologies. These are identified for both infill and redevelopment capacity, with each property providing up to 18 different development options.

Development Type	Housing Type	Size
<ul style="list-style-type: none"> • Infill • Comprehensive Redevelopment 	<ul style="list-style-type: none"> • Standalone • Terraced • Apartments 	<ul style="list-style-type: none"> • Small • Medium • Large

A number of other assumptions and proxy settings are used to identify and define differences across these scenarios to identify theoretical yields. This includes:

- A set of common footprint and floorspace sizes for small, medium and large typologies. Urban councils have used a set of sizes developed with Property Economics and reflecting examples provided alongside MDRS examples. A set of larger sites were used for the Horowhenua and Wairarapa Councils.
- Where councils have a minimum lot size rule this was used to calculate a common yield for a site over analysis of different typology yields.
- Height assumptions were also used to help differentiate between housing typologies, with houses limited to two storeys, terraces to three storeys and apartments only enabled on properties that allow for development of four storeys or more.
- An additional 20% of development capacity was also taken for shared service space in the calculation of apartments.
- Two additional changes were also made to modelling of mixed use and urban centre sites that provide for both residential and business uses, including:
 - Adding an additional proxy site coverage. As these sites are fully developable, a proxy site coverage allows for some onsite access and parking to help reflect a more realistic development outcome and onsite capacity .
 - Councils identified suitable ratios to split and apportion the remaining theoretical capacity on sites between residential and business uses.
- A rule was also used by some councils to avoid standalone housing being identified in centres where more intensive housing uses were anticipated.

2.4 Identifying business floorspace

Theoretical development capacity is similarly used to calculate the amount of theoretical development capacity available for business use.

Again, constraints affecting the developability of a site are reflected in the potential capacity.

Like the residential assessment two brownfield scenarios identify development capacity for infill and redevelopment scenarios. A third scenario of vacant land is also identified.

Vacant land is a subset of the redevelopment capacity and identifies capacity that is ready to develop. Additional work was undertaken to identify vacant properties. Councils used a number of methods including the use of rating land use codes (79 and 89), low improvement values, and local surveys to identify and verify lots as vacant.

The same mixed-use assumptions outlined for residential uses were also applied for business calculations. This included the use of ratios to split development capacity between residential and business uses across mixed-use and urban centres, ensuring there was no double counting of capacity.

It also included the use of a proxy site coverage to help provide a more realistic provision of the use of land and provision for parking and accessways to support shops and services across centres.

Two additional assumptions were also applied to industrial sites. This included a 50% site coverage to allow for yard space for industrial uses and a one storey height limit to reflect the large warehouse and factory building typology historically associated with this use.

3. Further testing for feasible and realisable development

Once the above calculations were completed, they were provided to Property Economics for their market assessment of feasibility. This is for brownfield sites under 5 hectares in size and greenfield sites over 5-hectares in size. Details of further modelling, assumptions and results are available in Appendix 1.2 and individual Council reports by Property Economics.

4. Additional points of note

Note: Given differences in timing, Porirua City Council and Wellington City Council separately commissioned Property Economics to undertake earlier modelling of residential development capacity to support their plan change processes. The parameters used in their most recent assessment is available in the council reports accompanying the HBA.