

Memorandum

To: Rebecca Kennedy, City of Vancouver (COV)

From: Nicole McDermott, WSP; Sam Rubin, WSP; and Tyler Bump, ECONorthwest

CC: Bryan Snodgrass, COV; and Chim Chune Ko, COV

Subject: Market and Land Capacity Analysis Methodology and Process for the Preferred Alternative

Date: February 9, 2025

Introduction

This memorandum (memo) outlines the methodology for modeling the estimated housing and employment capacities for the Preferred Alternative studied in the [OUR VANCOUVER](#) Comprehensive Plan Update State Environmental Policy Act Final Environmental Impact Statement (FEIS). This methodology memo serves as an addendum to the previously issued methodology memo issued for the Draft Environmental Impact Statement (DEIS), which included analysis of Alternative 1, Alternative 2, and the No Action Alternative. This Preferred Alternative represents the proposed future land use and zoning map for the Comprehensive Plan Update and informs future infrastructure and capital facilities planning required as part of the Comprehensive Plan. This memo follows the same outline as the previous methodology memo but includes additional sections where additional analysis was conducted.

This memo is divided into the following five sections that outline the process for modeling estimated housing and job capacity:

1. Prototype Development and Map Creation: details the creation of the Preferred Alternative.
2. Land Capacity Analysis Deductions (Preferred Alternative): covers the assumptions made for the initial land use capacity analysis and acreage deductions for the Preferred Alternative.
3. Housing Feasibility Analysis: describes the process for modeling the number of new housing units that the Preferred Alternative has the capacity to support.

4. Parcel-Level Modeling of Housing and Job Capacity (Action Alternatives): describes the process of modeling the number of housing units and jobs that the Preferred Alternative has the capacity to support.
5. Model Outputs for Housing and Jobs Capacity: summarizes the housing and jobs capacity numbers used in the FEIS analysis.

1. Prototype Development and Map Creation

The Comprehensive Plan Update proposes to rename and simplify the current land use designations and associated zoning codes to focus on 10 zoning districts:

- Low Scale Neighborhood (LSN)
- Medium Scale Neighborhood (MSN)
- Mixed Use Neighborhood (MU)
- Manufactured Home (MH)
- Regional Activity Center (RAC)
- Institutional/Campus (IC)
- Industrial/Employment (IE)
- Heavy Industrial (HI)
- Parks (POS)
- Natural Areas (NA)

Five of the eight zoning districts (LSN, MSN, MU, RAC, and IC) developed for the Comprehensive Plan Update would allow for a mix of employment and housing types at varying scales and densities. For example, the MSN zoning district would allow housing prototypes with a higher density than single-family housing, but a lower density than podium or tower developments allowed in MU and RAC zoning districts. The Manufactured Home zone is applied to existing mobile home parks in Vancouver and does not permit redevelopment except for in limited cases to comply with HB 1220 and requirements to allow permanent supportive housing and emergency shelters in all zones that allow housing or hotels. The HI, IE, POS, and NA zones do not allow housing development.

Analysts used the steps described below to develop the Preferred Alternative for the FEIS.

Preferred Alternative Development Steps:

1. **Develop Prototypes:** EcoNorthwest created eighteen housing prototypes that are likely to develop in Vancouver (see Table 1). Prototypes reflect current development trends within the city and the potential for different housing types based on recent

changes in state legislation. The prototypes cover a variety of housing types from single-family homes and four-story walk-ups to towers and podiums. Each prototype has an estimated dwelling-units-per-acre (DUA) value. Prototype allowances were updated for the Preferred Alternative to reflect updated zoning language and density allowances.

2. **Assign Prototypes to Zoning Districts:** Housing prototypes that were identified are those most likely to occur in the different zoning districts that will allow housing (LSN, MSN, MU, RAC, and IC). See Table 1 **Error! Reference source not found.**

Note: No housing prototypes were identified in IE, HI, MH, POS, or NA because no housing will be allowed.

3. **Prepare Preferred Land Use Alternative:** Finalized Preferred Alternative Map that shows zoning districts throughout the city. This step was developed over many iterations and was prepared with multiple rounds of review with community partners, city staff, the planning commission, and city council.

Refinement of the alternatives was informed by comments on the DEIS, extensive public input, best planning practices, existing city council policy guidance, existing and planned enhanced transit corridors, locations of parks/open space and schools, and locations of growth nodes/corridors/centers.

Table 1. Housing Prototypes by Zone

Housing Prototypes	Dwelling Units Per Acre	Manufactured Home Park*	Low-Scale Neighborhood	Medium-Scale Neighborhood	Mixed-Use Neighborhood	Regional Activity Center	Institutional/Campus	Industrial/Employment*	Heavy Industrial*	Parks/Open Space/Natural Areas*
Single Family	7.3									
Duplex (side by side)	14.5									
Duplex (stacked)	14.5									
3 Townhouses	21.8									
Quadplex	28.5									
4 Townhouses	29.0									
Sixplex	43.0									
6 Townhouses	43.6									
Cottage Cluster	29.0									
Courtyard (attached)	28.5									
Small Single Stair	58.1									
Small Multiunit	43.6									
Small Multiunit (taller)	58.1									
Medium Multiunit	34.8									
Medium Multiunit (taller)	52.3									
3-story wood frame	65.3									
4-story wood frame	84.4									
Podium	152.5									
Tower	217.8									
Microunits 1	273.8									
Microunits 2	342.3									

*No housing prototypes are allowed

2. Land Capacity Analysis Deductions (Preferred Alternative)

Table 2 identifies the deductions used in the land capacity analysis model for the Preferred Alternative. As noted in the table, some deductions are different in the housing capacity analysis, which estimates the capacity for new housing units, compared to the employment capacity analysis, which estimates the capacity for new jobs. Table 2 also identifies different deductions for the land categories (Vacant, Underutilized, and Built) included in the Clark County Vacant Buildable Lands Model (VBLM).¹

¹ The parcel dataset used in the model is the 2022 Clark County Vacant Buildable Lands Model (VBLM) data output.

Table 2. Deductions

Deduction	Zoning District						
	LSN	MSN	MU	RAC	IC	IE	HI
Land Use Split per Zoning Districts^(a)							
Residential	95%	90%	65%	60%	25 %	0%	0%
Employment ^(b)	5%	10%	35%	40%	75 %	100%	100 %
Critical Areas/Constrained Land Deductions							
Residential Capacity Analysis	50% of constrained lands are assumed to not develop.					N/A	
Employment Capacity Analysis	20% of Vacant and Underutilized constrained lands will not develop. 50% of Built constrained lands will not redevelop.						
Infrastructure Deduction							
Residential Capacity Analysis	31.5%					N/A	
Employment Capacity Analysis	31.5%					12.5% ^(d)	25%
Market Factor and Redevelopment Rate							
Residential Capacity Analysis	N/A (embedded in market feasibility analysis, see Section 3).						
Employment Capacity Analysis Market Factor	10% of Vacant and Underutilized lands will not develop given market conditions.						
Employment Capacity Analysis Redevelopment Rate (only applies to Build land) ^(e)	0%	12.8%	27.4%	0%			
Job loss deduction ^(f)			13 jobs/net acre				
Small Parcels, Easements, and Tax Value							
Exclude small parcels less than 1,000 SF	Applies to all zoning districts.						
Exclude roads and easements	Applies to all zoning districts.						
Exclude parcels given a zero value in Clark County's VBLM output ^(g)	Applies to all zoning districts.						

Notes:

- (a) The residential/non-residential splits are model assumptions based on likely development trends for new zoning districts. These are not intended to reflect future codified requirements.
- (b) Employment represents any non-residential use that is assumed to produce jobs instead of housing units.
- (c) Critical areas/constrained lands were identified per the 2022 Clark County VBLM dataset

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- (d) Infrastructure deductions for IE are lower than the 25% used in the 2022 Clark County VBLM for Industrial to account for the more urban context in Vancouver.
 - (e) Redevelopment from employment uses to different employment uses in Low Scale Neighborhood (LSN), Medium Scale Neighborhood (MSN), Institutional/Campus (IC), and Industrial/Employment (IE) zones is unlikely and, therefore, no redevelopment rate is assumed for these zoning districts. However, an “intensification or refill” factor is applied to IE and Heavy Industrial (HI) zoning districts to establish the employment need (see Section 4 for details on the intensification factor). Redevelopment rates for Mixed Use Neighborhood (MU) and Regional Activity Center (RAC) were calculated by determining the feasibility of the four-story mixed-use prototype across all MU/RAC zones and its rate of feasibility.
 - (f) The job loss deduction applies to Built land in the MU and RAC zoning districts that is assumed to be redeveloped. This assumption accounts for a loss of existing jobs on the redeveloped parcels.
 - (g) The county assessor will flag a property as zero-value if appraisers determine the legally created tax lot does not have market value or is deemed exempt from taxes.

Key: HI = Heavy Industrial; IC = Institutional/Campus; IE = Industrial/Employment; LSN = Low Scale Neighborhood; MSN = Medium Scale Neighborhood; MU = Mixed Use Neighborhood; N/A = not applicable; RAC = Regional Activity Center; SF = square feet; VBLM = Vacant Buildable Lands Model

3. Housing Feasibility Analysis

The housing capacity analysis for the preferred alternative relies on a parcel-level feasibility analysis. The feasibility analysis examined the zoning district for each parcel, which prototypes are assumed to be allowed by future zoning, and which prototype is the most feasible option based on market conditions and available assessors’ data.

Generally, the feasibility analysis examined the following factors:

- Total value per square foot of each parcel, which is equal to the total market value (land and buildings) divided by assessed acres.
- Price per square foot required to develop each building prototype.

If the total value per square foot is less than the prototype price to develop, then the prototype is considered feasible.

The feasibility analysis identified which prototypes would be considered feasible from a market perspective, which can result in multiple prototypes being viable. The model for the Preferred Alternative assigns the prototype that is considered the most feasible, or the prototype that is the most likely to develop because it is the most affordable to develop. Ultimately, this process looks at every parcel across the city and models the potential for a property to develop/redevelop. Only parcels identified as feasible with a corresponding prototype are included in the capacity analysis in Step 4 below. An overview of the feasibility analysis is included as Attachment .

4. Parcel-Level Modeling of Housing and Job Capacity (Action Alternatives)

Once the feasibility analysis (Section 3) was complete, analysts modeled housing and job capacity for the preferred alternative, applying the assumptions identified in Table 1. The following subsections identify the modeling process for the housing capacity analysis and job capacity analysis. A detailed process of this section is included as Attachment .

Housing Capacity Analysis

The first step in the housing capacity analysis model applied the deductions for critical areas, infrastructure, and residential versus employment allocation at the parcel level (see Table 2). The model then removed parcel fragments (1,000 square feet or smaller), roads/easements, and zero-value parcels.

Once all land reductions were applied, the model used the remaining net acreage to apply housing densities based on the most feasible prototype per the feasibility analysis (see Section 3). If a parcel was not determined to have a feasible prototype, then housing density was not applied to the parcel.

Housing Unit Yield Equation

$$\begin{aligned} & \text{Gross Acreage of a parcel} - \text{land reductions} = \text{net acreage} \\ & \text{Net acreage} \times \text{DUA (prototype DUA)} = \text{housing unit output per parcel} \end{aligned}$$

Post-Processing Deductions

Homeowner Association Deduction

The City sampled properties in different subdivisions across Vancouver to determine the possible existence of a homeowner association (HOA) that might limit densification or redevelopment potential. Then, using property titles obtained through a title company, analysts reviewed language in homeowner association bylaws to identify which areas may have language that could restrict the implementation of Washington State House Bill (HB) 1110. HOAs that had some degree of restrictive language were identified and the redevelopment capacity that was modeled in those areas was reduced by 70%. The 70% housing capacity reduction assumes that some of the redevelopment potential of parcels within HOAs with restrictive language would not occur because of a lack of enforcement of HOA policies. At the time of this analysis in early 2026, HB 1110 does not include retroactive application to pre-existing governing documents adopted by HOAs.

Master Plan Deduction

In areas where the city has adopted Master Plans or approved Development Agreements (DAs), the housing units and jobs projected in those documents was used instead of the model output. This requires an override where the existing master plan geography is allocated the projected number of housing units and/or jobs identified in the adopted plan or DA. At the time of this analysis in early 2026, the following master plan or DAs were identified:

- Vancouver Heights
- Vancouver Innovation Center
- Columbia Palisades
- Section 30
- Waterfront
- HQ Vancouver

Existing Unit Deduction

Clark County assessor data was used to identify the number of existing units on lots that include feasible housing development per the feasibility analysis. Existing units were then deducted to avoid double counting the total number of units per lot.

Model Output

Total number of housing units assumed in the preferred alternative based on market feasibility, land capacity, and HOA, Master Plan or DA, and existing unit adjustments. These housing unit numbers are used for the Preferred Alternative in the FEIS analysis.

Employment Capacity Analysis

The employment capacity analysis was similar to the housing analysis, but as identified in Table 2, some of the model assumptions were different. Additionally, the employment capacity analysis did not use the feasibility analysis to determine redevelopment potential, but instead applied a redevelopment rate, as noted in Table 2.

Employment Target

An additional step in the employment capacity analysis was the establishment of an employment target that accounts for “work-from-home” jobs and “intensification” or “refill,” which relates to a percentage of new jobs occurring within existing employment space through an intensification of the number of jobs per square foot. These two factors reduce the amount of land needed to support anticipated job growth and are an important consideration when determining whether the employment capacity of an alternative will meet the anticipated employment growth. At a summary level, the process for determining the employment target was as follows:

- Start with the anticipated employment growth of 43,198 jobs, as detailed in the Economic Opportunity Analysis.
- Separate potential job growth by industry sector based on two-digit North American Industry Classification System (NAICS) codes and assign jobs/NAICS codes to zoning districts.
- Apply a 13% deduction for “work from home” to all job sectors except transportation, food/services, manufacturing, and construction.²
- Apply a 23% deduction for jobs in HI and IE zoning districts because these districts may see an intensification of jobs within existing heavy industrial or employment developments. This means more jobs per acre may be produced in the future on heavy industrial or employment lands than currently exists, and a reduction is applied to the employment target because additional land would not be needed to support these jobs.³

This process resulted in a net employment need of 38,792, which reflects the number of new jobs that will need to be supported within the land capacity of the Preferred Alternative. The deductions above account for new jobs that could be accommodated within existing developments or from work from home and therefore, additional land capacity is not needed for those jobs.

Employment Land Capacity Analysis

Similar to the housing capacity analysis, the employment capacity analysis was conducted at the parcel level. The first step in the employment capacity analysis model applied the deductions for critical areas, infrastructure, and residential versus employment allocation, as identified in Table 2. The model then applied the market factor for Vacant and Underutilized land and redevelopment rate for Built land, as detailed in Table 2. *Note: the redevelopment rate does not apply consistently across the zoning districts.*

Once all the land reductions were applied, the model applied the employment densities (jobs per acre) listed below for each zoning district.⁴

² Work-from-home deduction is based on 2023 American Community Survey estimates, table B038601, work from home percentage for Vancouver. Clark County is at 21.8% per the same data.

³ The intensification factor is based on data from Portland vetted with industrial stakeholders as part of Portland’s EOA (Economic Opportunity Analysis) Industrial Land Committee process. Longitudinal point-level Quarterly Census of Employment Wage data for Vancouver are not available. Intensification is essentially “refill,” indicating an amount of land that will intensify in job density.

⁴ The employment densities are based on recent development trends in similar contexts and professional judgment.

- LSN: 6
- MSN: 6
- MU: 48
- IC: 46
- RAC: 54
- IE: 30
- HI: 9

The final step in the employment capacity analysis is intended to avoid double counting existing jobs when a property is assumed to redevelop. Washington Employment Security Department Quarterly Census of Employment Wage data was used to determine the average jobs per acre within future MU and RAC zoning districts. Only the MU and RAC zoning districts were used because those are the only zones where a redevelopment rate is applied (see Table 3 footnotes for additional details). The average number of jobs per acre was estimated at 13, which was applied as a deduction to the output of jobs on built parcels in MU and RAC zoning districts.

Employment Yield Equation:

$$\text{Gross Acreage of a parcel} - \text{land reductions} \times \text{market factor/redevelopment rates} = \text{net acreage}$$

$$\text{Net acreage} \times \text{jobs/acre} - 13 \text{ jobs/acre on Built Mixed Use Neighborhood and RAC parcels} = \text{jobs output per parcel}$$

Model Output: Total number of jobs assumed in the preferred alternative based on vacancy status and redevelopment potential.

5. Model Outputs for Housing and Jobs Capacity

Table 3 below shows the model output for the DEIS action alternatives, the No Action Alternative, and the Preferred Alternative.

Table 3. Model Outputs for Housing Yields and Employment Yields

Alternative (City Only)	Methodology	Housing Yields	Employment Yields
No Action	Clark County VBLM (refer to DEIS methodology memo)	29,600 units	16,600 jobs
Alternative 1	Feasibility/Redevelopment potential (refer to DEIS methodology memo)	45,100 units	46,000 jobs
Alternative 2	Feasibility/ Redevelopment potential (refer to DEIS methodology memo)	50,696 units	49,300 jobs
Preferred Alternative	Feasibility/Redevelopment Potential (Refer to Section 4)	44,111 units	45,145 jobs

Key: VBLM = Vacant Buildable Lands Model

Attachment 1

Feasibility Analysis Overview

Attachment 2
Land Capacity Analysis Process

DATE: May 27th, 2025
TO: Nicole McDermott and Sam Rubin, WSP
FROM: Tyler Bump and Michelle Anderson, ECONorthwest
SUBJECT: Vancouver Comp Plan Update – Market Feasible Capacity Analysis

Overview

WSP partnered with ECONorthwest to assess the potential housing capacity for two different EIS alternatives for the comprehensive plan update for the City of Vancouver. ECONorthwest worked with WSP to complete this analysis, referred to as the *market-feasible housing capacity*, given the potential land use intensities of the different place types of the alternatives. The difference between the alternatives was the place type designated to each parcel, which could result in different citywide totals for market-feasible housing capacity.

For the capacity analysis, ECONorthwest completed a financial analysis that models a developer’s decision-making process and cash flow equation. We created pro forma models to test the financial feasibility of various housing densities that might be allowed in different place types. We estimated the market feasible capacity of multiple prototypical developments, or *housing prototypes*. These prototypes reflect theoretical development profiles that could potentially comply with proposed zoning standards to understand what the market was most likely to deliver if zoning was a constraint.

Why is development feasibility and pro forma analysis important?

Development can be costly and risky. Getting funding to construct new development requires lenders and investors to be reasonably confident they will earn enough financial return to justify the risks and attract equity to a project.

Economic or market feasibility is generally assessed by comparing the expected revenues (home sales, net income from rents, room rates) against the costs of development. If a development is not feasible, it will not be built, contrary to a city’s housing goals.

Approach

Prototypes and Assumptions

ECONorthwest analyzed nearly 20 housing prototypes that were of various configurations and resulting densities, including general forms such as single-family, townhome, lowrise, garden-style, and midrise apartment developments. We based the prototypes on recent existing developments throughout the City of Vancouver as well as potential scales of housing that might be allowed in the future given legislative changes at the state level. Though the scale of development ranges substantially throughout the city, we developed approximate prototypes that could be possible in Vancouver.

We drew our initial market and construction cost insights from third-party sources such as the American Community Survey (ACS), Costar, Redfin, and Craftsman, and then vetted

those assumptions with local developers and brokers through various interviews. Though cost assumptions typically stay consistent throughout a city, we created a model to help differentiate the revenue assumptions (i.e., rent and sales prices) by census tract. This model used rent and sales data from ACS, to interpolate what revenue assumptions might be for each census tract in the city.¹

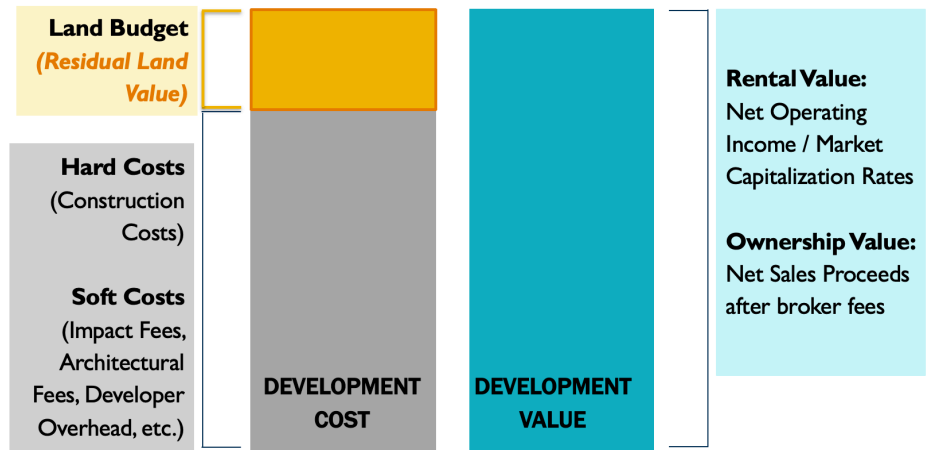
We then aligned similar block groups, based on rent and sales prices, into newly-defined market areas. We took those results and compared them to the city-wide average to understand how each market area related to the city-wide average (expressed as a ratio). We then applied that ratio as an input to each rent or sales price on a prototype level with the most up-to-date market data from CoStar and Redfin. This revenue model allowed us to refine our pro forma results spatially. The model therefore considered that different areas across Vancouver would have varying demand for different types of housing, which impacts the resulting feasibility of housing development.

Pro Forma Financial Analysis Methods

The pro forma model used a residual land value (RLV) metric to evaluate feasibility. RLV measures the land budget a developer would have to purchase land after accounting for potential development costs and revenues.

Exhibit 1: Example of Feasible Development using Residual Land Value (RLV) Model

Source: ECONorthwest



¹ ACS has two notable limitations we try and correct for: 1) there are many instances of tracts with missing (or "NA") estimates for rents, due to low rates of survey response or simply because there are no observations of a given type of apartment in that tract and 2) we often see unusually low rents because the ACS conflates market rate apartments with other structures like informal rental arrangements. We interpolated missing rent values by using an inverse-distance weighted average smoothing function, so that tracts with missing values take the average of their neighbors, ordered by proximity. We then cluster census tracts together into market areas (approximately 10 total areas) based on adjacency and similarity of rents and tenure splits.



Generally, if the RLV is equal to or above land prices in the potential development area, the development is considered feasible at market rate. If the RLV is zero dollars, the development could be feasible if land were donated for free. However, if the RLV is less than zero, the development is likely infeasible unless a developer receives additional subsidies or incentives, including free land. Results from this method describe a general analysis of prototypes and does not consider the many potential unique conditions that could be factors in development feasibility (e.g., increased predevelopment costs, low land basis from longtime land ownership). For these reasons, residual land value analyses should be thought of as a strong indicator of the relative likelihood of development, rather than an absolute measure of return to the investor or developer for any specific site.

In our feasibility analysis, we used key financial data like rent, operating costs, and development expenses for each prototype. To evaluate rental prototypes, we determined the leasable square footage, calculated revenue, deducted vacancy and operating costs (such as taxes, insurance, maintenance, management, select utilities) and arrived at the annual net operating income (NOI). For the ownership prototypes, we calculated gross sales price and subtracted commissions.

We calculated development costs by applying the cost per square foot values to different product types (e.g., residential, retail) and adding parking costs. We then summed those values to a total hard cost and calculated the soft cost, contingency, and developer fees to arrive at the total development cost.

To evaluate rental prototypes, we derived the value for each prototype by either dividing the NOI by a market-driven return on cost threshold (for higher-density prototypes) or by determining the loan capacity given debt service assumptions and NOI (for lower density prototypes). Return on cost is an important metric because it establishes the threshold where the potential returns offset project risks. Developers compete for capital in a market against other real estate and non-real estate investments. If return on cost is too low, a developer will not be about to attract capital, and the project will not move forward – this is most relevant for higher density prototypes that tend to attract institutional capital that is mobile across markets and investment products. We then summed those values to arrive at a total value for each prototype. We then calculated the land budget (the RLV) by subtracting the total development cost from the total value.

For lower-density rental prototypes, relating NOI to debt service requirements is more appropriate given that these projects are smaller and therefore tend not to attract institutional capital, but they are similar to larger projects in that debt is typically the largest source of funding for a project and if return requirements for debt can't be met, the development will not be able to attract the capital and the project won't move forward. For these prototypes, we solved for the land budget (the RLV) that was possible given the NOI on the project and potential terms, interest rates, and debt service coverage ratio



requirements. For the ownership prototype, we determined the land budget by subtracting total development costs from gross sales less commission and a spread on cost to account for profit.

For both rental and ownership prototypes we divided the total land budget by site square footage, arriving at a residual land value per square foot of land for each market area – this was the key variable for inclusion in the site specific analysis we conducted with the help of WSP.

Site-Specific Capacity Analysis

We delivered two key outputs for comparison to site-specific data and to finalize the market-feasible capacity analysis. For each prototype, we delivered both the calculated dwelling units per acre as well as the residual land value (RLV) per square foot of land for each market area. The units of these outputs (normalized by land area) allowed us to take the data and apply it to each site.

For each parcel, WSP and ECONorthwest:

1. Exported a GIS csv with each parcel's market area, placetype, and key assessor data such as parcel area and total value (based on land and improvement value).
2. Calculated the total value per square foot of land (land + improvement value, divided by site area). This approach does not attempt to make adjustments to assessor's land value to values that are more reflective of real market value. We typically find that assessor data can lag behind market value. Therefore, this approach will result in an optimistic estimate of capacity
3. Subtracted total value per square foot of land from the RLV per square foot of each prototype for the corresponding market area to arrive at the remaining value.
4. Identified the feasible prototypes that were allowed by the placetype applied to the parcel – the prototype with remaining value greater than \$0.
5. For parcels where the RLV was zero or negative (where the total value based on assessor data exceeded the RLVs of the allowed prototypes), the market-feasible capacity analysis resulted in no feasible housing prototype.



Land Use Model – Step-by-Step Process

The land use model for the Our Vancouver Comprehensive Plan was developed using Python in ArcGIS Pro. Instead of estimating land capacity based on broad citywide acreage, the analysis is conducted at the parcel level scenario, making it easier to show where housing and jobs are likely to be located across Vancouver. Housing and employment analyses are done separately, relying on the same data but with different assumptions about redevelopment, infrastructure, and critical areas.

1. Starting Datasets

- 2022 Vacant Buildable Lands Model (VBLM) dataset. Only parcels within the City of Vancouver are used in the land capacity analysis.
- Parcel-level feasibility analysis based on zoning. This analysis determines if a parcel is considered feasible for development and what prototype is most feasible by parcel.

2. Land Capacity Analysis

- Start with the 2022 VBLM dataset that has been updated to reflect the zoning or comprehensive plan designation assigned to the various alternatives.
- Apply filters to exclude land types **not eligible for development**:
 - **Infrastructure rights-of-way and easements**: roads, rail, utility corridors, etc.
 - **Public ownership exclusions**: parks and other tax-exempt lands unless redevelopment is anticipated. Coordination with the parks department is needed to update the inventory.
 - **Parcels below minimum size thresholds** or lacking infrastructure access may be excluded.
 - Parcels less than 1,000 square feet are excluded.
- **Split the remaining land by intended use**:
 - Allocate percentage of parcel acreage to either **residential or employment uses** (jobs/housing split) based on zoning.

- From this point in the analysis, only the assigned acreage is used for either residential or employment analysis.
- Apply further deductions:
 - **Critical areas:** Critical areas identified by the County’s VBLM process and are considered ‘constrained’ in the dataset.
 - Development in critical or constrained areas is limited. For housing analysis, lands in critical areas are counted at half their total area. For employment analysis, vacant or underutilized constrained lands are reduced by 20%, while built constrained lands are reduced by 50% in the calculation.
 - **Market factor for Employment:** proportion of land that will realistically be developed within the planning timeframe.
 - 10% of Vacant or Underutilized lands will not develop given market conditions. 10% reduction in total acreage by parcel is deducted.
 - **Redevelopment Rate for Employment:** 12.8% of lands zoned Mixed Use are anticipated to be redeveloped. 27.4% of lands zoned Regional Activity Center are anticipated to be redeveloped.
 - **Infrastructure:** proportion of land within a parcel that would be allocated for infrastructure placement.
 - 31.5% deduction in total acreage of a parcel for residential analysis
 - 31.5% deduction in total acreage of a parcel for employment analysis for all zones except Industrial/Employment (IE) and Heavy Industrial (HI). IE has a reduction of 12.5% and HI has a reduction of 25%.

3. Apply Density/Intensity Ratios

- Assign densities to each parcel based on their zoning. Density ratios are applied to the acreage remaining after deductions.
 - Residential: units per acre based on typology identified during feasibility analysis.
 - Employment: jobs per acre based on zoning.

4. Apply loss of existing jobs on redeveloped parcels

- The job loss deduction applies to Built (as determined by the Vacant Buildable Lands Model) land in the MU and RAC place types that are assumed to be redeveloped. This assumption accounts for a loss of existing jobs on the redeveloped parcels.
 - Reduce the number of jobs by parcel by 13 jobs/net acre.
- This analysis was done post-processing and is not included in the python notebook.

Housing Capacity Analysis (Python Notebook)

```
import arcpy
alt = "DatasetName"

new_field_name = "HousingYields"
new_field_type = "DOUBLE"

fields = [f.name for f in arcpy.ListFields(alt)]
if new_field_name not in fields:
    arcpy.AddField_management(alt, new_field_name, new_field_type)
    print(f"Field '{new_field_name}' added to {alt}.")
else:
    print(f"Field '{new_field_name}' already exists in {alt}.")

with arcpy.da.UpdateCursor(alt, ["HousingAcres", "DUAforPrototype", "GrossAcres",
    "Constrained", "AlternativeZoning", new_field_name, "ExcludedParcels", "VBLMStatus"]) as
cursor:
    for row in cursor:
        # First Deduction: Constrained vs nonConstrained land
        if row[3] == 0 or row[3] is None:
            row[0] = row[2]
        else:
            row[0] = row[2] * .5

        #filters
        if row[6] == "Road or Easement":
            row[0] = 0
        if row[2] < .022:
            row[0] = 0
        if row[7] == "Zero Value":
            row[0]= 0

        housing_yield = row[0]
        # 2nd Deduction: Development Assumption
        if row[4] == "LSN":
            housing_yield = housing_yield * .95
        elif row[4] == "MSN":
            housing_yield = housing_yield * .90
        elif row[4] == "MU":
            housing_yield = housing_yield * .65
        elif row[4] == "IC":
            housing_yield = housing_yield * .25
```

```

elif row[4] == "RAC":
    housing_yield = housing_yield * .60
elif row[4] == "IE":
    housing_yield = housing_yield * 0
else:
    housing_yield = housing_yield * 0

# 3rd Deduction: Infrastructure
if row[4] == "LSN" or row[4] == "MSN":
    housing_yield = housing_yield - (housing_yield * .315)
elif row[4] == "MU":
    housing_yield = housing_yield - (housing_yield * .315)
elif row[4] == "IC":
    housing_yield = housing_yield - (housing_yield * .315)
elif row[4] == "RAC":
    housing_yield = housing_yield - (housing_yield * .315)
elif row[4] == "IE":
    housing_yield = housing_yield - (housing_yield * .315)
else:
    housing_yield = 0

# Housing Yields Estimate
row[0] = housing_yield
try:
    row[5] = housing_yield * row[1]
except:
    row[5] = housing_yield * 0

# Update the row
cursor.updateRow(row)

print("Field values calculated and updated.")

```

Employment Capacity Analysis (Python Notebook)

```
import arcpy
```

```
alt = "LandUseAlt1_Scenario2"
```

```
new_field_name = "EmploymentAcres"
```

```
new_field_type = "DOUBLE"
```

```
new_field_name2 = "EmploymentYields"
```

```
new_field_type2 = "DOUBLE"
```

```
fields = [f.name for f in arcpy.ListFields(alt)]
```

```
if new_field_name2 not in fields:
```

```
    arcpy.AddField_management(alt, new_field_name2, new_field_type)
```

```
    print(f"Field '{new_field_name2}' added to {alt}.")
```

```
else:
```

```
    print(f"Field '{new_field_name2}' already exists in {alt}.")
```

```
fields = [f.name for f in arcpy.ListFields(alt)]
```

```
if new_field_name not in fields:
```

```
    arcpy.AddField_management(alt, new_field_name, new_field_type)
```

```
    print(f"Field '{new_field_name}' added to {alt}.")
```

```
else:
```

```
    print(f"Field '{new_field_name}' already exists in {alt}.")
```

```
with arcpy.da.UpdateCursor(alt, ["HousingAcres", "MaxDUA", "GrossAcres", "Constrained",  
"AlternativeZoning", new_field_name, "Excluded",  
"LandUseAlt2_VUGA_VBLM_Details_utilizatio", new_field_name2]) as cursor:
```

```
    for row in cursor:
```

```
        #VACANT
```

```
        if row[7] == "Vacant" or row[7] == "Underutilized":
```

```
            # First Deduction: Constrained vs nonConstrained land
```

```
            if row[3] == 0 or row[3] is None:
```

```
                row[5] = row[2]
```

```
            else:
```

```
                row[5] = row[2] * .8
```

```
        #filters
```

```
        if row[6] == "Road or Easement":
```

```
            row[5] = 0
```

```
        if row[2] < .022:
```

```
            row[5] = 0
```

```
        if row[7] == "Zero Value":
```

```

row[0]= 0

employment_acres = row[5]
# 2nd Deduction: Employment land Splits
if row[4] == "LSN":
    employment_acres = employment_acres * .05
elif row[4] == "MSN":
    employment_acres = employment_acres * .1
elif row[4] == "MU":
    employment_acres = employment_acres * .35
elif row[4] == "IC":
    employment_acres = employment_acres * .75
elif row[4] == "RAC":
    employment_acres = employment_acres * .4
elif row[4] == "IE":
    employment_acres = employment_acres * 1
elif row[4] == "HI":
    employment_acres = employment_acres * 1
else:
    employment_acres = employment_acres * 0

# 3rd Deduction: market supply factor deduction
employment_acres = employment_acres - (employment_acres * .1)

# 4th Deduction: Infrastructure
if row[4] == "LSN" or row[4] == "MSN":
    employment_acres = employment_acres - (employment_acres * .315)
elif row[4] == "MU":
    employment_acres = employment_acres - (employment_acres * .315)
elif row[4] == "IC":
    employment_acres = employment_acres - (employment_acres * .315)
elif row[4] == "RAC":
    employment_acres = employment_acres - (employment_acres * .315)
elif row[4] == "IE":
    employment_acres = employment_acres - (employment_acres * .125)
elif row[4] == "HI":
    employment_acres = employment_acres - (employment_acres * .25)

# Employment Acres estimate
row[5] = employment_acres

# 5th Deduction: Apply Job Density by placetype
if row[4] == "LSN" or row[4] == "MSN":
    employment_acres = employment_acres * 6

```

```

elif row[4] == "MU":
    employment_acres = employment_acres * 48
elif row[4] == "IC":
    employment_acres = employment_acres * 46
elif row[4] == "RAC":
    employment_acres = employment_acres * 54
elif row[4] == "IE":
    employment_acres = employment_acres * 30
elif row[4] == "HI":
    employment_acres = employment_acres * 9
else:
    employment_acres = employment_acres * 0

# Employment Yield estimate
row[8] = employment_acres

else:
    # First Deduction: Constrained vs nonConstrained land
    if row[3] == 0 or row[3] is None:
        row[5] = row[2]
    else:
        row[5] = row[2] * .5

#filters
if row[6] == "Road or Easement":
    row[5] = 0
if row[2] < .022:
    row[5] = 0
if row[7] == "Zero Value":
    row[0] = 0

employment_acres = row[5]
# 2nd Deduction: Employment land Splits
if row[4] == "LSN":
    employment_acres = employment_acres * .05
elif row[4] == "MSN":
    employment_acres = employment_acres * .1
elif row[4] == "MU":
    employment_acres = employment_acres * .35
elif row[4] == "IC":
    employment_acres = employment_acres * .75
elif row[4] == "RAC":
    employment_acres = employment_acres * .4
elif row[4] == "IE":

```

```
    employment_acres = employment_acres * 1
elif row[4] == "HI":
    employment_acres = employment_acres * 1
else:
    employment_acres = employment_acres * 0
```

```
# 3rd Deduction: redevelopment
```

```
if row[4] == "MU":
    employment_acres = employment_acres * .128
elif row[4] == "RAC":
    employment_acres = employment_acres * .274
elif row[4] == "IE":
    employment_acres = employment_acres * 0.0
elif row[4] == "LSN" or row[4] == "MSN":
    employment_acres = employment_acres * 0.0
else:
    employment_acres = employment_acres * 0
```

```
# 4th Deduction: Infrastructure
```

```
if row[4] == "LSN" or row[4] == "MSN":
    employment_acres = employment_acres - (employment_acres * .315)
elif row[4] == "MU":
    employment_acres = employment_acres - (employment_acres * .315)
elif row[4] == "IC":
    employment_acres = employment_acres - (employment_acres * .315)
elif row[4] == "RAC":
    employment_acres = employment_acres - (employment_acres * .315)
elif row[4] == "IE":
    employment_acres = employment_acres - (employment_acres * .125)
elif row[4] == "HI":
    employment_acres = employment_acres - (employment_acres * .25)
```

```
# Employment Acres estimate
```

```
row[5] = employment_acres
```

```
# 5th Deduction: Apply Job Density by placetype
```

```
if row[4] == "LSN" or row[4] == "MSN":
    employment_acres = employment_acres * 6
elif row[4] == "MU":
    employment_acres = employment_acres * 48
elif row[4] == "IC":
    employment_acres = employment_acres * 46
elif row[4] == "RAC":
    employment_acres = employment_acres * 54
```

```
elif row[4] == "IE":
    employment_acres = employment_acres * 30
elif row[4] == "HI":
    employment_acres = employment_acres * 9
else:
    employment_acres = employment_acres * 0

# Employment Yield estimate
row[8] = employment_acres

# Update the row
cursor.updateRow(row)

print("Field values calculated and updated.")
```