



How-To-Guide Simple Regeneration + Carrying Capacity Parametric Calculations

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HOW-TO GUIDE FOR CALCULATORS SUPPORTING THE CARRYING
CAPACITY / PARAMETRIC CALCULATIONS EXCEL SPREADSHEET

PARAMETRIC CALCULATIONS OVERVIEW

CARRYING CAPACITY + PARAMETRIC CALCULATIONS

Parametric Calculations Assignment

- ▶ This assignment builds from the Site Discovery work completed in earlier in the semester.
- ▶ Parametric Calculations are the next step towards developing “Design Scenarios”
- ▶ Develop Parametric Calculations for your Team’s Project Site

CONTINUED >

CARRYING CAPACITY + PARAMETRIC CALCULATIONS

GLOSSARY

Roughcasting:

- ▶ Numerical *'Napkin Sketch'*
- ▶ Fast, simple, ballpark estimates and models
- ▶ Leverages limited information
 - [Bootstrap](#) ideas, engage engineers with 'Collateral' early
 - Mostly numerical analysis with no or very limited drawings needed.

Parametric Calculations

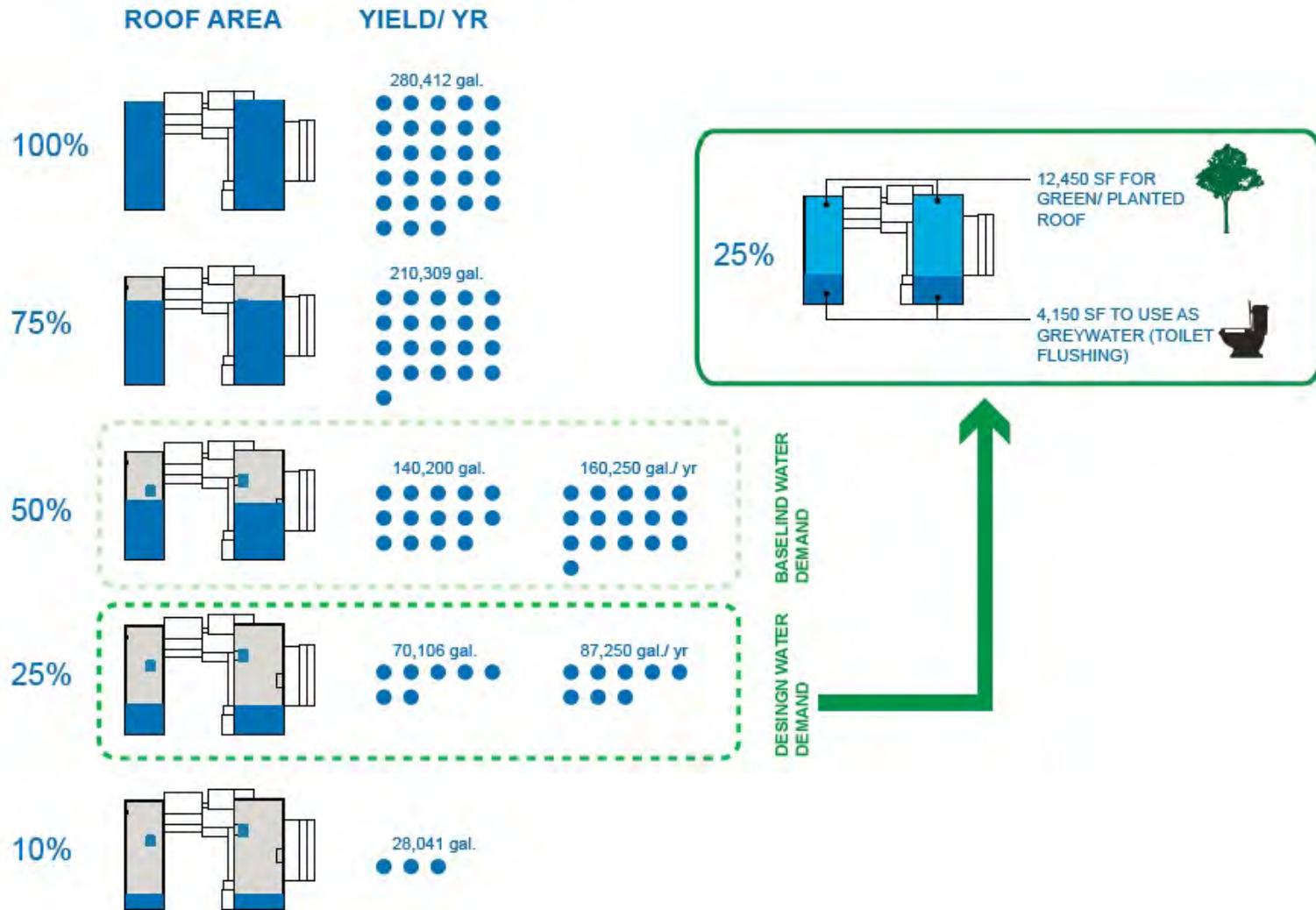
- ▶ Simple, linear adjustments incrementally 'run' against a Baseline to rapidly test outcomes.

Carrying Capacity

- ▶ The carrying capacity of a biological species in an environment is the maximum population size of the species that the environment can sustain indefinitely, given the food <energy>, habitat, water, and other necessities available in the environment.
- ▶ For this assignment we testing the carrying capacity of our identified project site relative to an on-site population of Homo-sapiens.

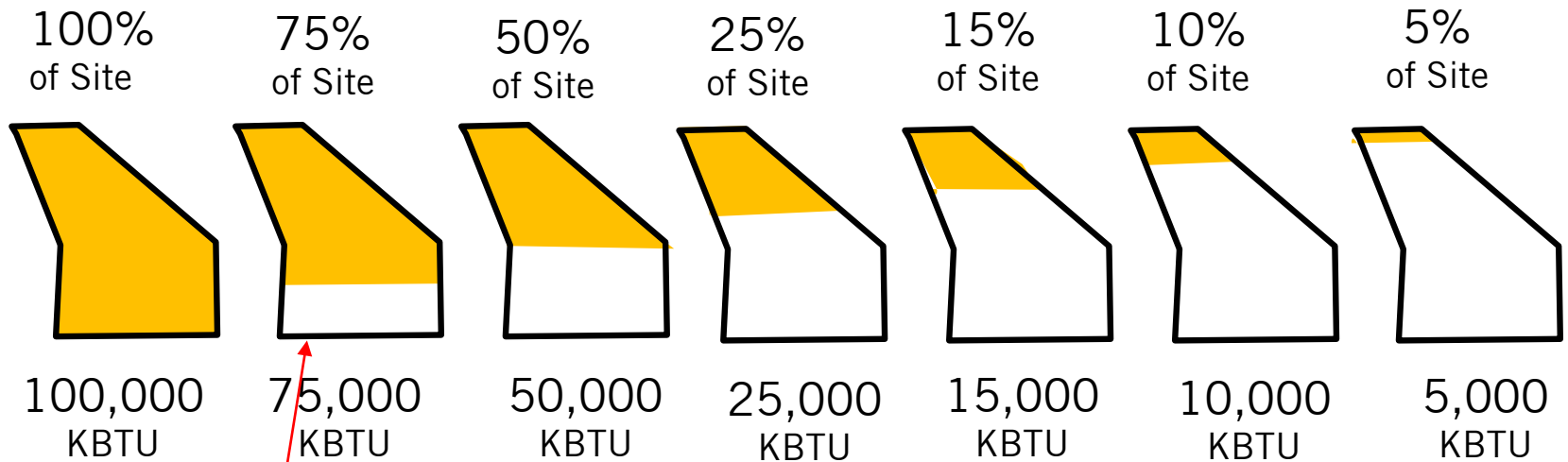
**PARAMETRIC
INFOGRAPHIC
EXAMPLES**

PARAMETRIC CALCULATIONS INFOGRAPHIC EXAMPLE



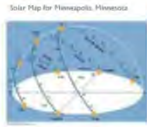
PARAMETRIC CALCULATIONS INFOGRAPHIC EXAMPLE

PV | On-Site Photo-Voltaic Energy Potential (Estimate)

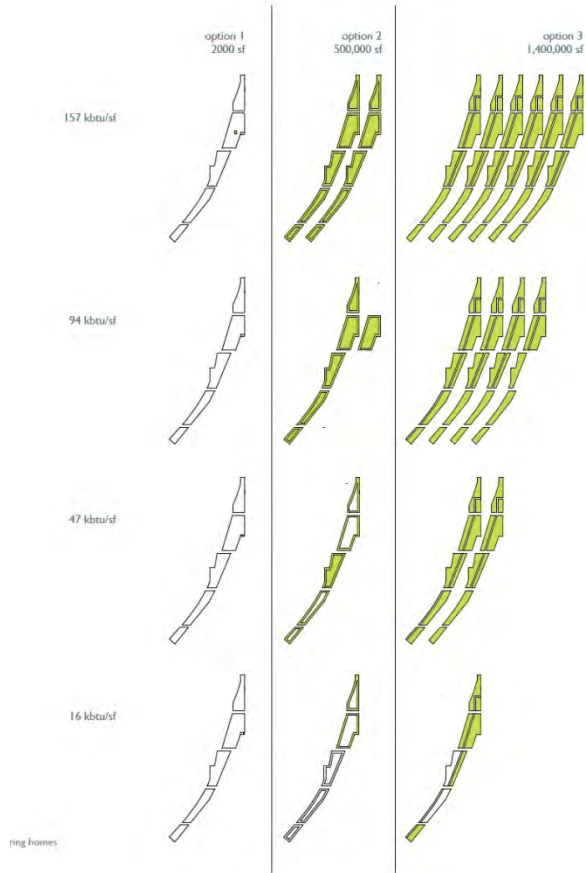


ARCH 8561 - THIS REPRESENTS AN OUTLINE OF YOUR SITE

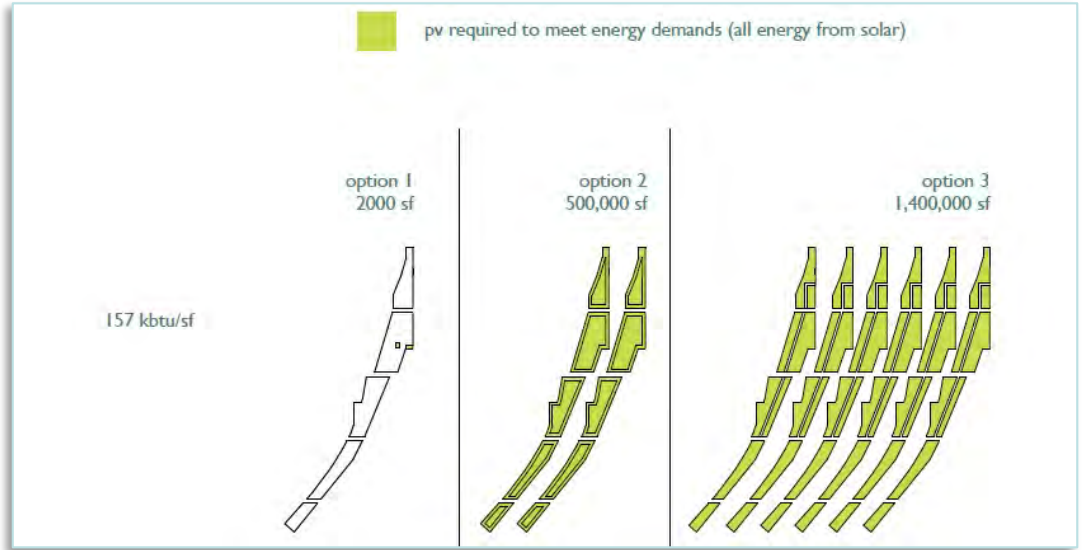
PARAMETRIC CALCULATIONS INFOGRAPHIC EXAMPLE



pv required to meet energy demands (all energy from solar)



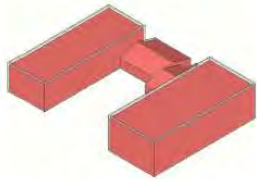
pv required to meet energy demands (all energy from solar)



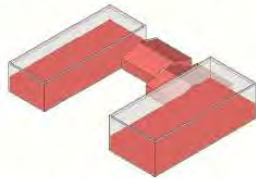
PARAMETRIC CALCULATIONS INFOGRAPHIC EXAMPLE

Annual Energy Use

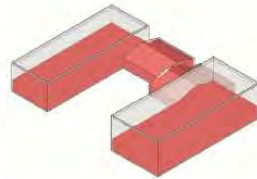
Average 50% Reduction 60% Reduction 70% Reduction 80% Reduction 90% Reduction



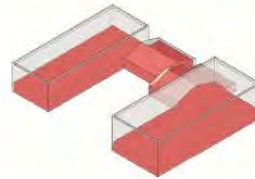
98 kBtu/sf
6,115,200 kBtu
per year



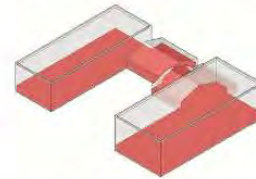
49 kBtu/sf
3,057,600 kBtu
per year



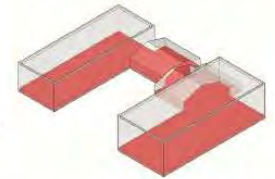
39 kBtu/sf
2,433,600 kBtu
per year



29 kBtu/sf
1,809,600 kBtu
per year



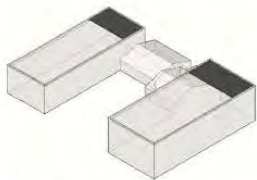
19 kBtu/sf
1,185,600 kBtu
per year



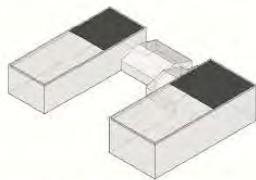
9 kBtu/sf
561,600 kBtu
per year

Annual PV Production

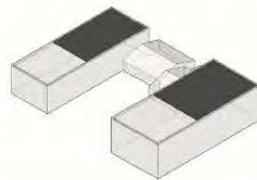
20% PV 40% PV 60% PV 80% PV 100% PV



169,924 kBtu
per year



339,849 kBtu
per year



509,773 kBtu
per year



679,698 kBtu
per year



849,623 kBtu
per year

PARAMETRIC CALCULATIONS INFOGRAPHIC EXAMPLE

Production of Solar Photovoltaic Energy:

100% of our site area
7,681,641 kW

75% of our site area
5,761,230 kW

50% of our site area
3,840,820 kW

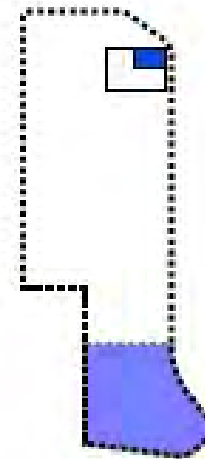
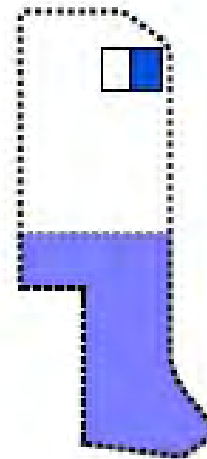
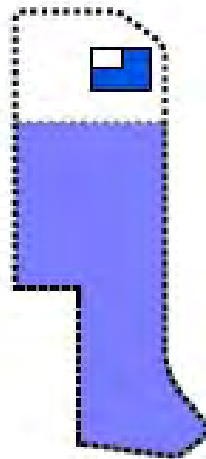
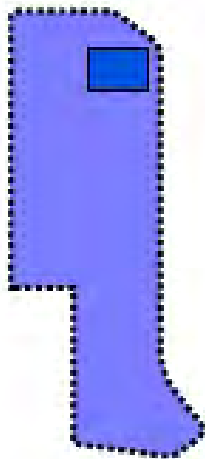
25% of our site area
1,920,410 kW

100% of building area
389,250 kW

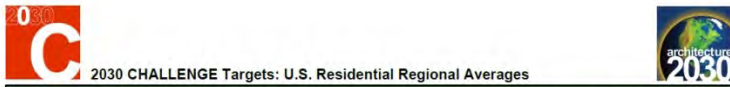
75% of building area
291,937 kW

50% of building area
194,625 kW

25% of building area
97,312.5 kW



PARAMETRIC CALCULATIONS NUMERICAL EXAMPLE



2030 CHALLENGE Targets: U.S. Residential Regional Averages

U.S. Regional Averages for Site Energy Use and 2030 Challenge Energy Reduction Targets by Residential Space/Building Type (RECS 2001) ¹							
From the Environmental Protection Agency (EPA): Use this chart to find the site fossil-fuel energy targets.							
Residential Space/Building Type ²	Average Source EUI ^{3,4} (kBtu/Sq.Ft./Yr)	Average Site EUI ^{3,4} (kBtu/Sq.Ft./Yr)	2030 Challenge Site EUI Targets (kBtu/Sq.Ft./Yr)				
			50% Target	60% Target	70% Target	80% Target	90% Target
Northeast							
Single-Family Detached	67.5	45.7	22.9	18.3	13.7	9.1	4.6
Single-Family Attached							
Multi-Family, 2 to 4 units							
Multi-Family, 5 or more units							
Mobile Homes							

2030 Energy Use Baselines for Residential Buildings (CBECS)



2030 CHALLENGE Targets: U.S. Residential Regional Averages



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			50% Target	60% Target	70% Target	80% Target	90% Target
Northeast							
Single-Family Detached	67.5	45.7	22.9	18.3	13.7	9.1	4.6
Single-Family Attached	68.6	50.3	25.1	20.1	15.1	10.1	5.0
Multi-Family, 2 to 4 units	78.8	57.8	28.9	23.1	17.3	11.6	5.8

Notes

- This table presents values calculated from the Energy Information Administration in the Residential Energy Consumption Survey (RECS), conducted in 2001. The survey data is available on the EIA's website at <http://www.eia.doe.gov/energyuse/rececs2001/tables/tables.html>.
- Space/Building Type use descriptions are taken from valid building activities as defined by the Energy Information Administration in the Residential Energy Consumption Survey (RECS), conducted in 2001.
- The average Source EUI and Site EUI are calculated in kBtu/Sq.Ft./Yr as weighted averages across all buildings of a given space type in the RECS 2001 data set. Source Energy is a measure that accounts for the energy consumed on site and the energy consumed during generation and transmission in supplying energy to the site.
Converting Site to Source Energy:
Source Energy values are calculated using a conversion for electricity of 1 kBtu Site Energy = 3.013 kBtu Source Energy, a conversion for natural gas of 1 kBtu Site Energy = 1.024 kBtu Source Energy, and a 1:1 conversion for fuel oil and district heat.
- Energy Information Administration (EIA), U.S. Residential Energy Intensity Using Weather-Adjusted Primary Energy by Census Region and Type of Housing Unit, 1980-2001, Table 8c.
- Energy Information Administration (EIA), U.S. Residential Energy Intensity Using Weather-Adjusted Site Energy by Census Region and Type of Housing Unit, 1980-2001, Table 8c.

EUI: Energy Use Intensity

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Perkins+Will

