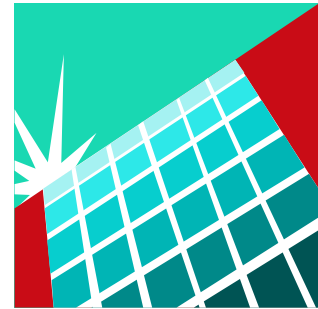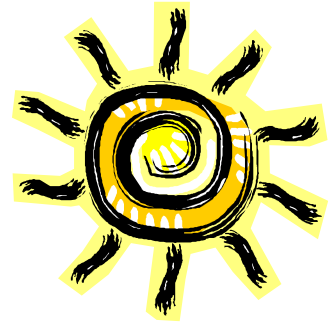# Sustainability Through Solar Access:

Boulder's Practical Experience

Boulder's Energy Tradition

- Solar Access Regs since 1984

- "Green Points" for building construction
  - Conservation and environ impact

- Energy conservation variance
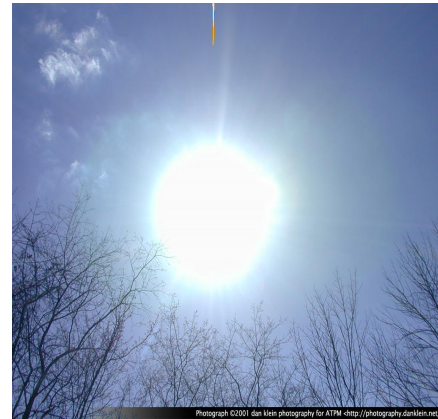 - Setback reduction for systems/conservation

Current Efforts

- <u>Objective</u>: 24% lower GHG by 2024

- <u>Climate Action Plan</u>

  – Energy efficiency: All "green" public bldgs

  – Renewable fuels – 7% of electricity now

  – Reduce VMT

Why Solar Access Regs?

- Protect solar potential

- Improve livability

- Encourage alternate energy source
  - Passive
  - Active, hot water
  - Photo-voltaic (PV)

What Approach?

- <u>Subdivision standards</u>
  - Street and lot orientation to max solar exposure

- <u>Zone / bulk standards</u>
  - Lot sizes, setbacks, height to preserve solar

- <u>Building design standards</u>
  - Accept solar
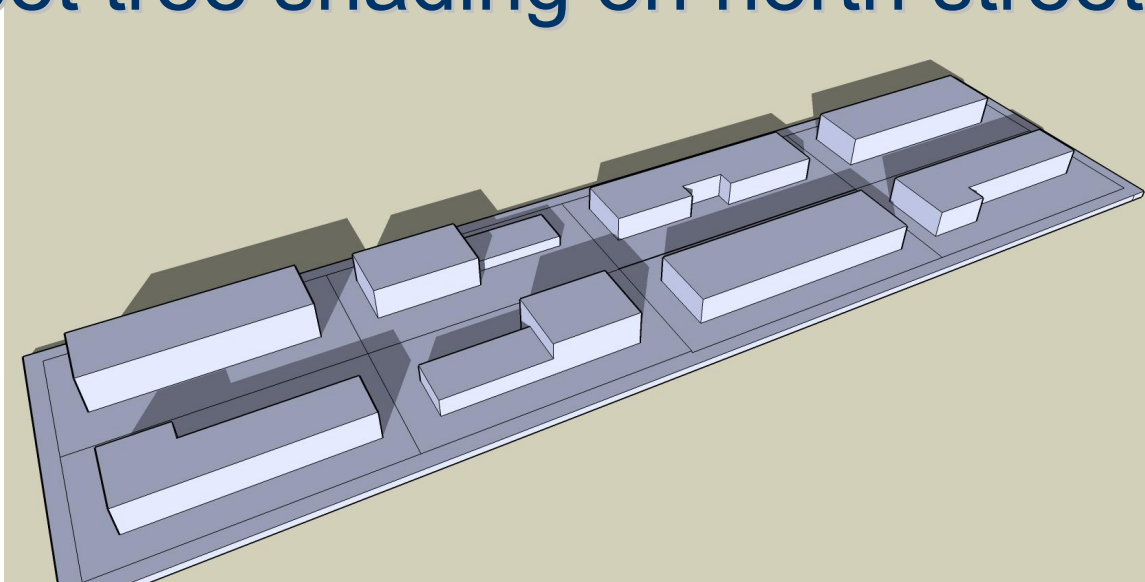 - Don't shade neighbors

Subdivision +/-

+ Easy for greenfield sites
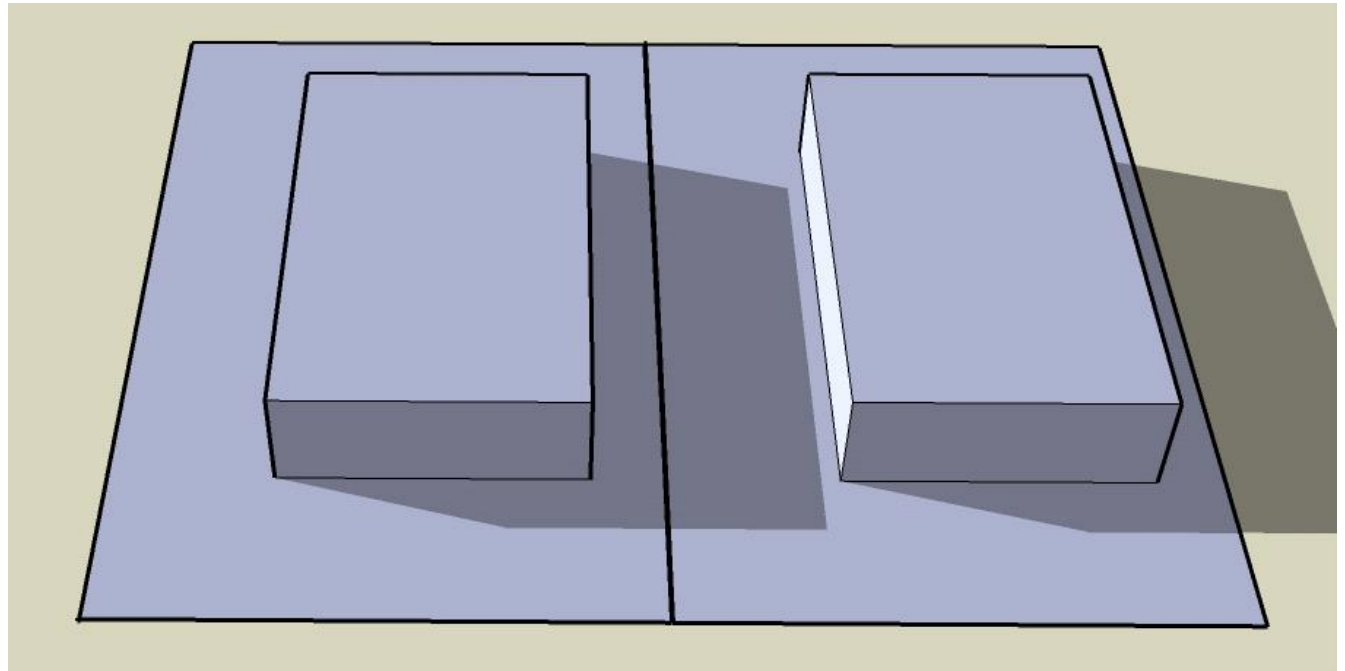
+ Can maximize solar potential

Subdvision +/-

- Urban design of wide lots / buildings
- Street tree shading on north street side
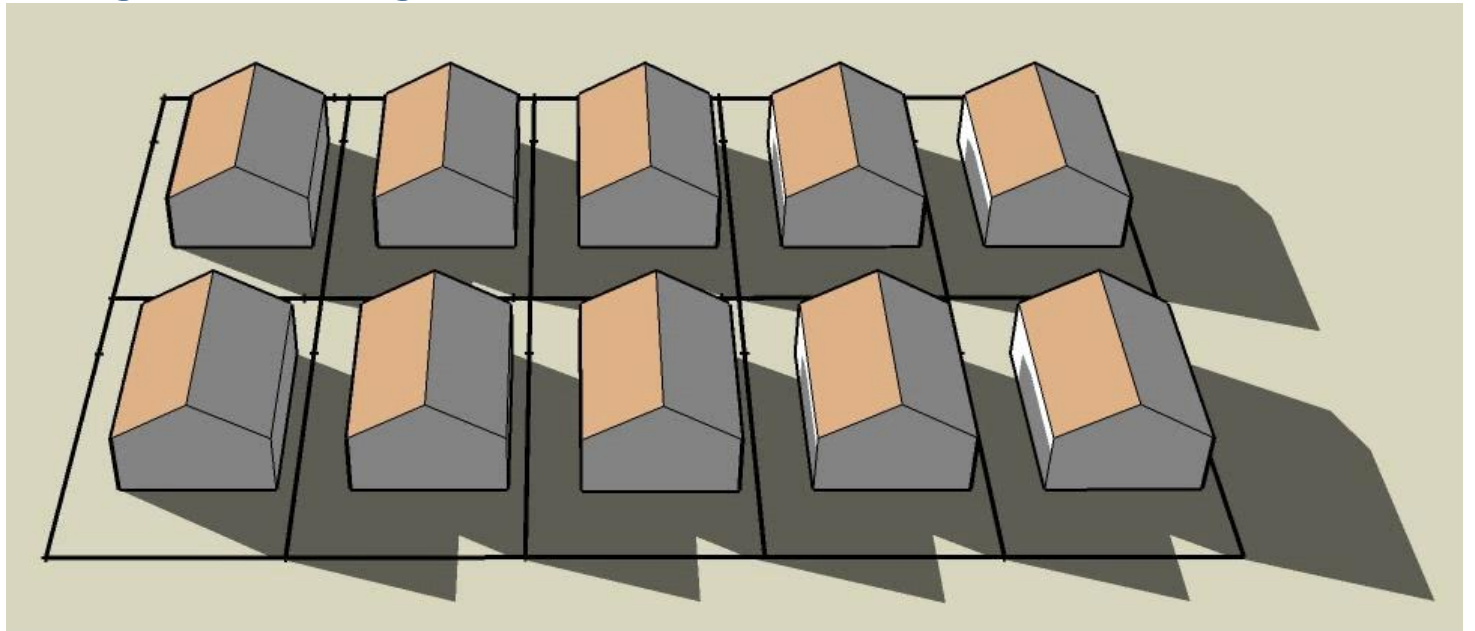
Zone / Bulk +/-

+ Bulk standards simple
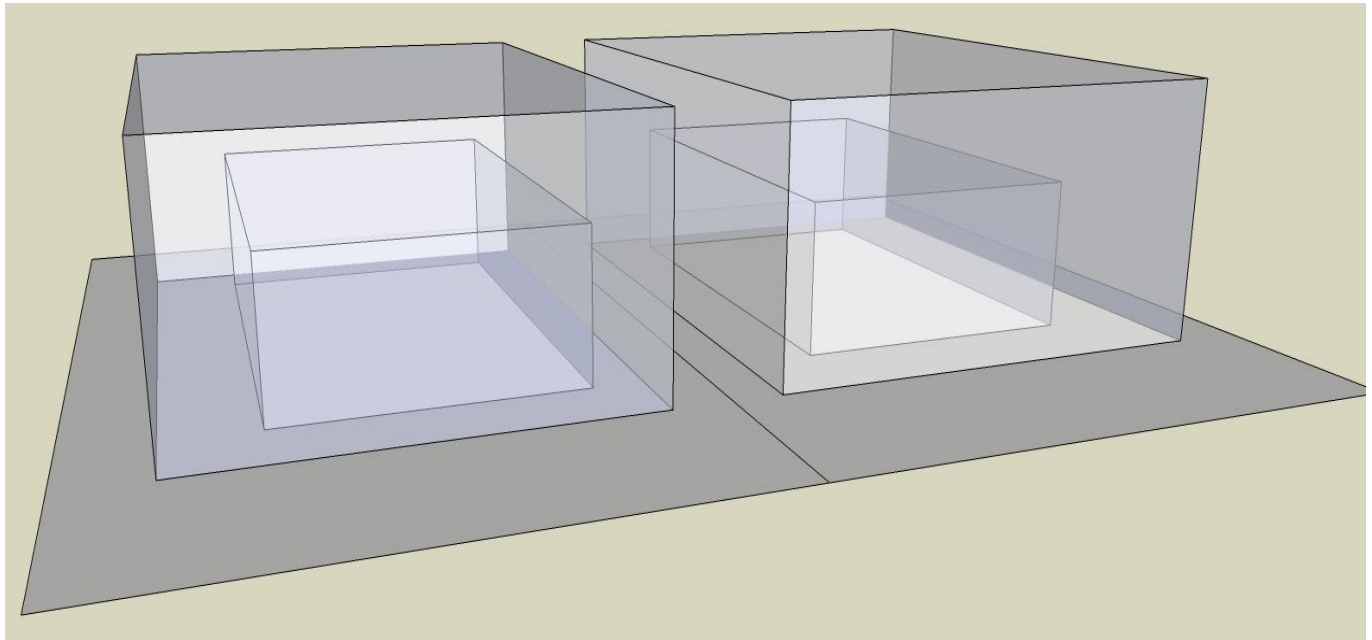
+ Flexible, adjust to terrain

Zone / Bulk +/-

- Many zones – if much topography

- Existing buildings – roof access at best
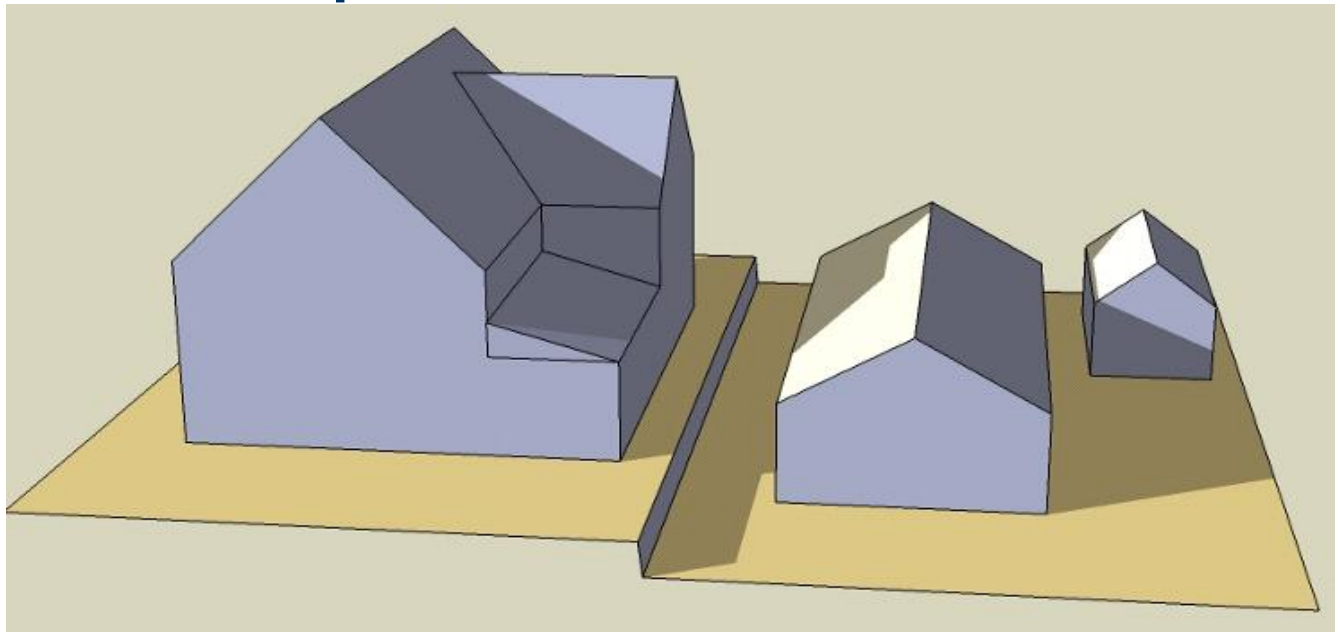
Building Design +/-

+ Simple if envelope not pushed

+ Design flexibility

Building Design +/-

- Full envelope or topo is complex
- Neighbor disputes

Boulder's Approach

- Adopted in 1984

- Reduce reliance on fossil fuels

- Regulates structures / vegetation:
  - Subdivision design
  - Building design
    - NOT zone / bulk standards
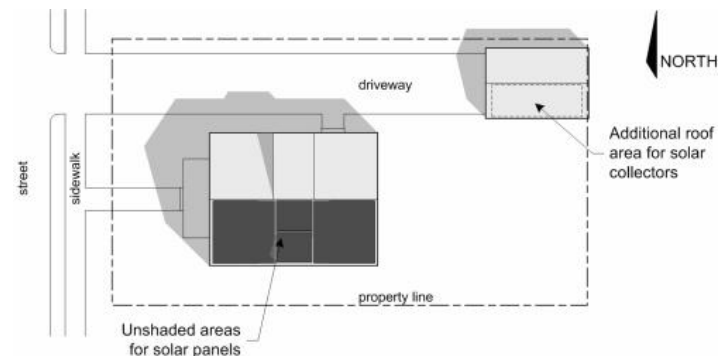
Boulder's Approach

- <u>Subdivision standards</u>
  - Streets oriented to max solar access
  - Lots oriented to max solar potential

- <u>Vary thru PUD</u>
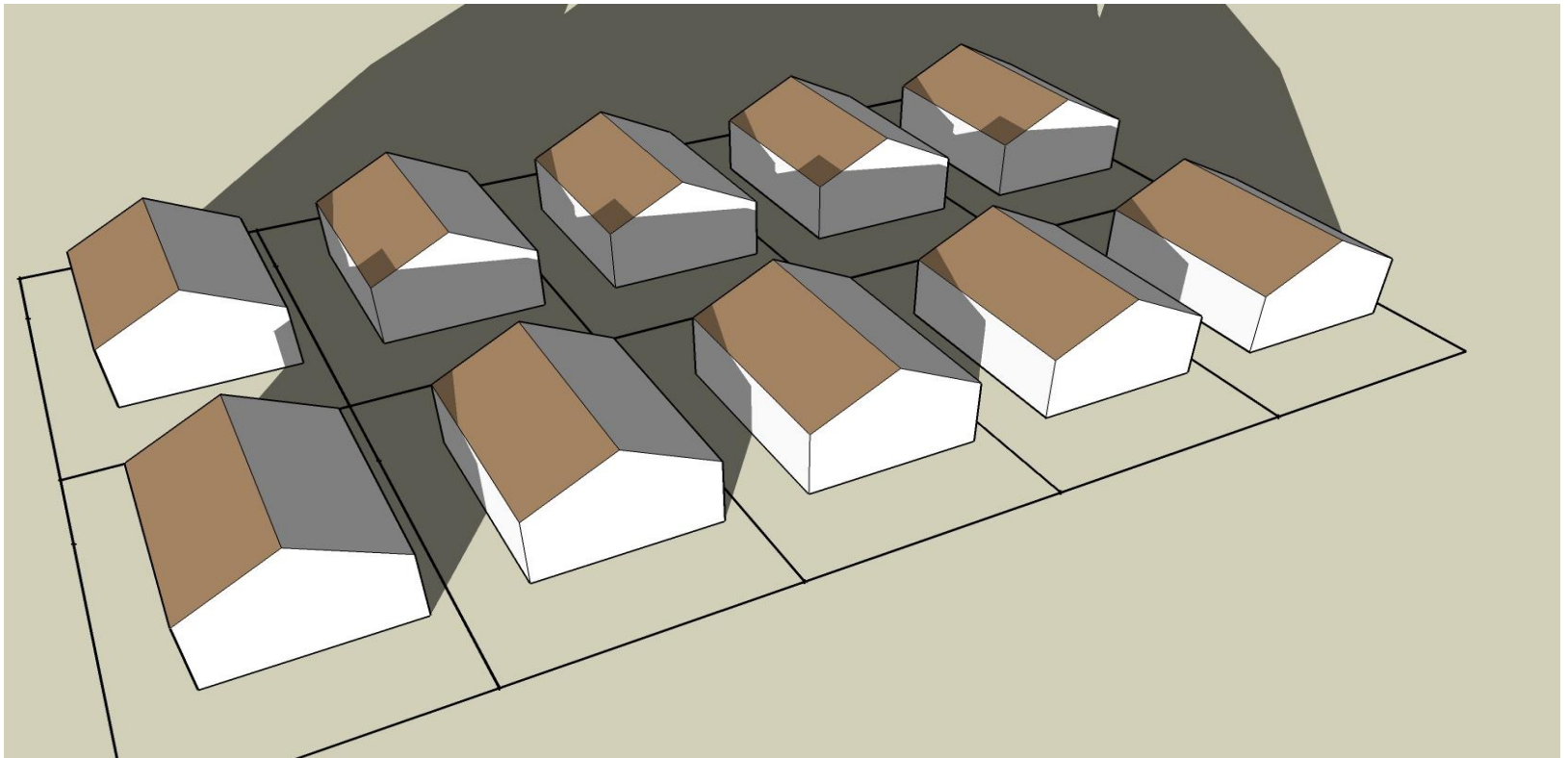 - Few greenfield subs
  - Mostly infill
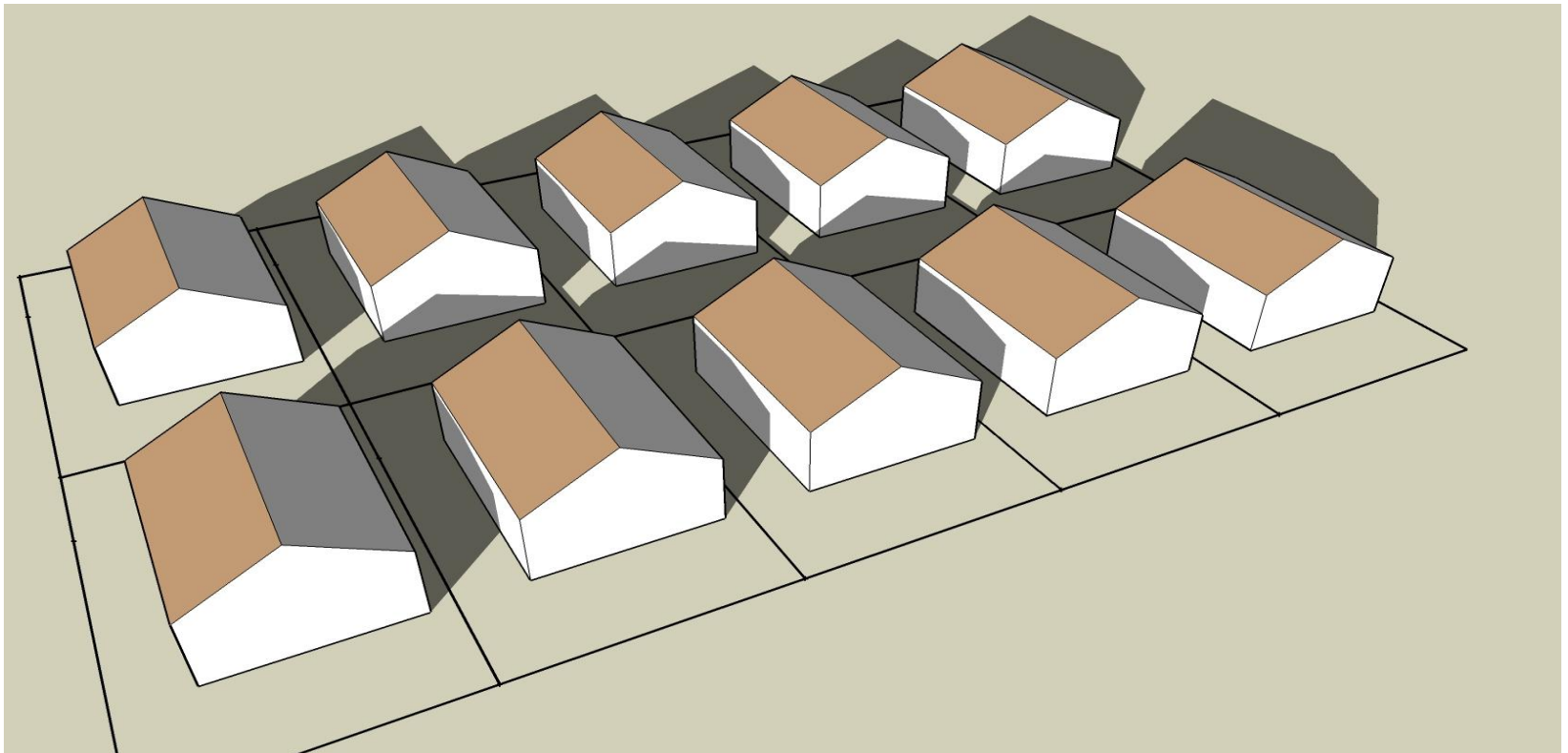
Boulder's Approach

- <u>Building Design</u>
  - South wall next to heated space
  - Wall and / or roof access 10 am - 2 pm
  - A roof surface:
    - < 30 degrees true east west
    - Flat or south slope
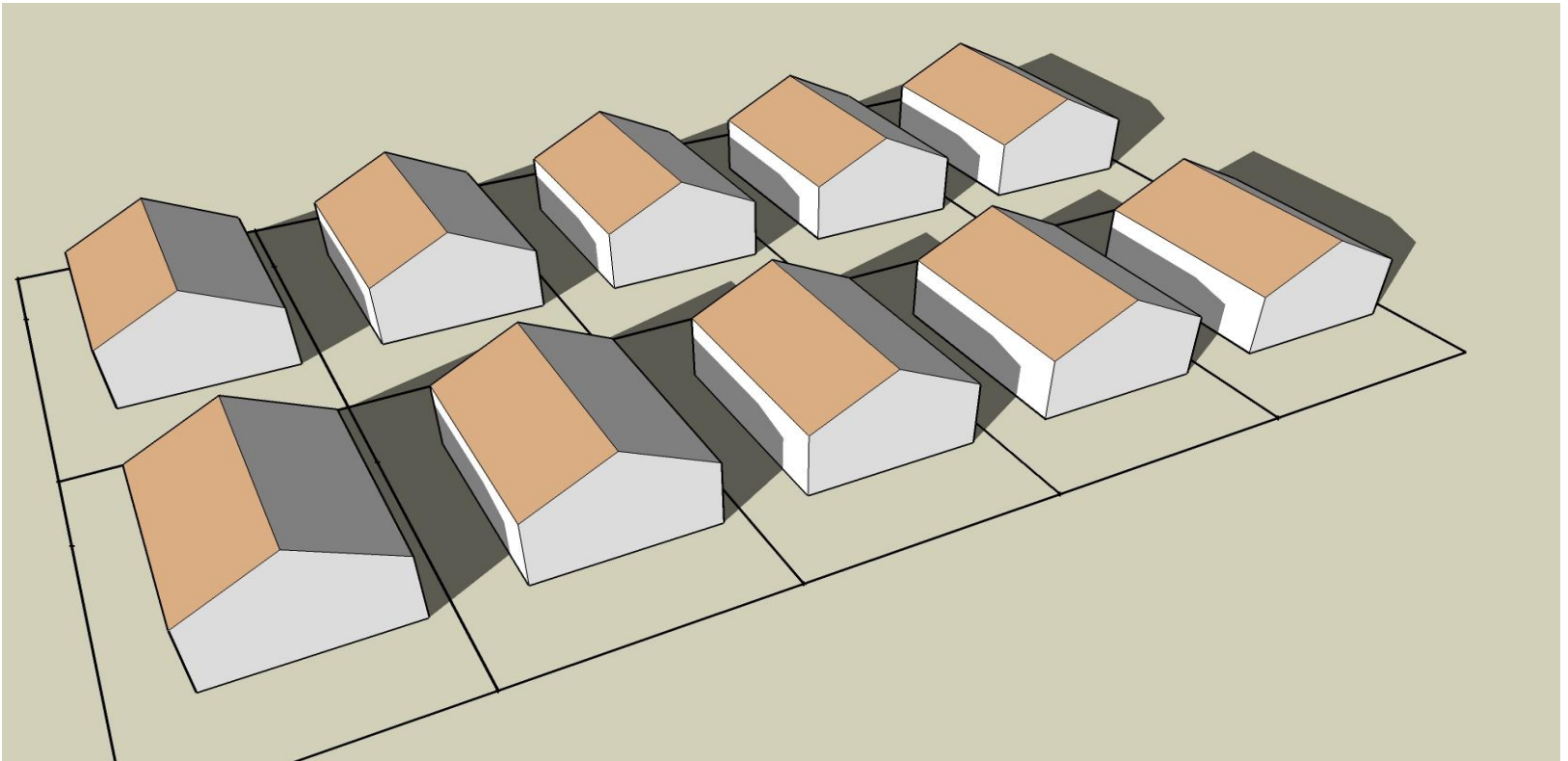   - Support 75 s.f. collector per unit

Roof Protection 8 am – n.a.
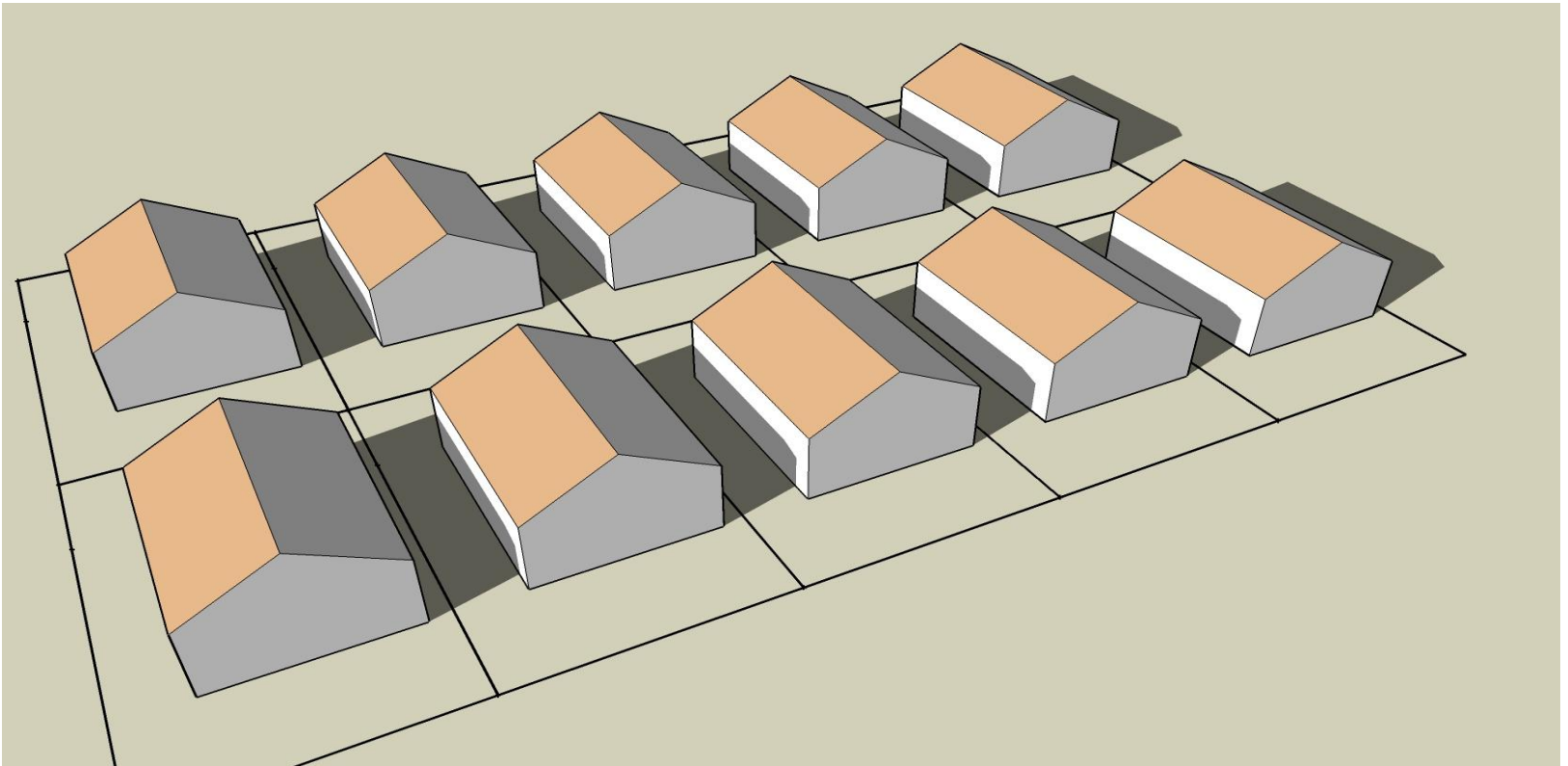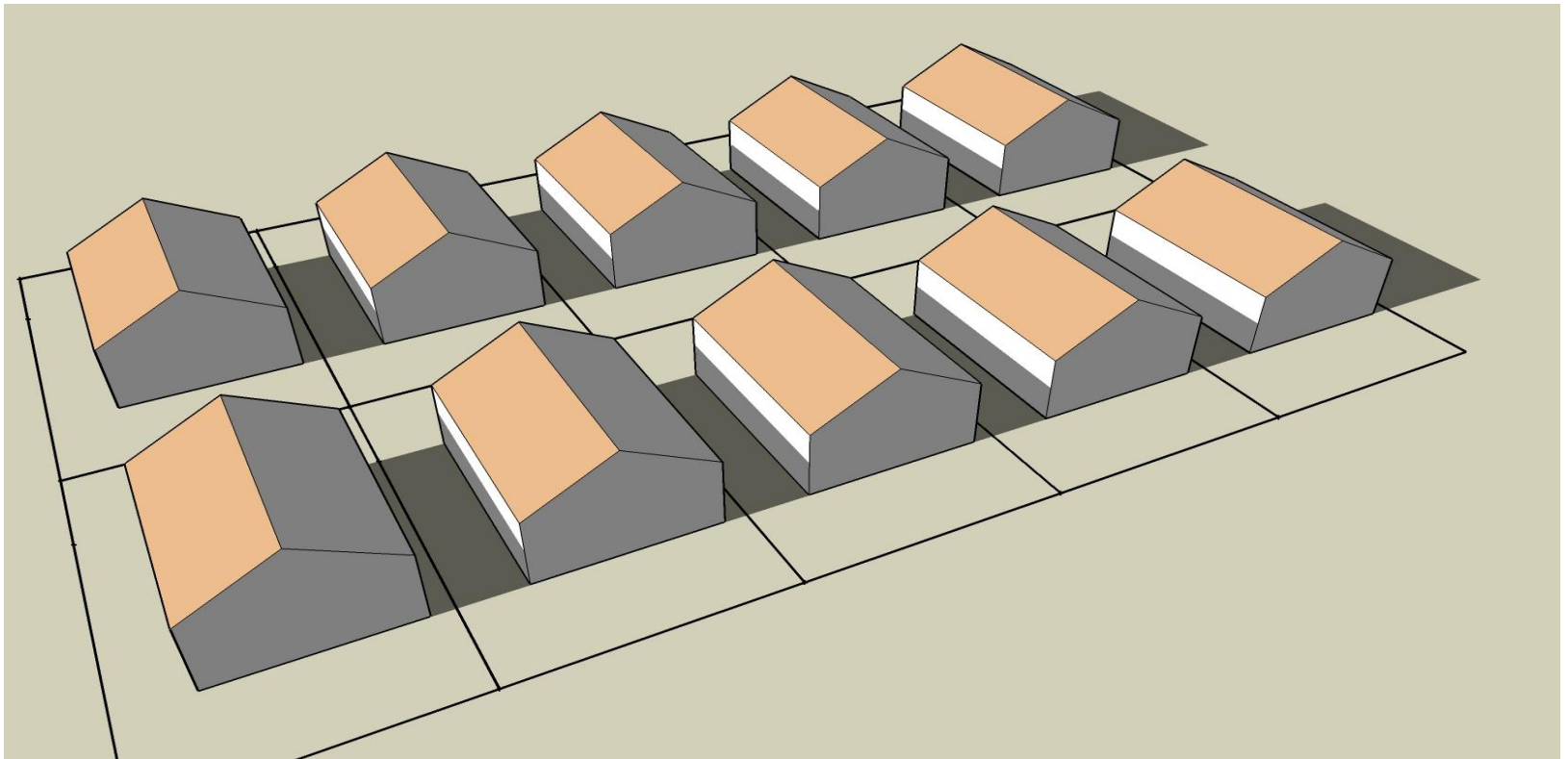
Roof Protection 9 am – n.a.
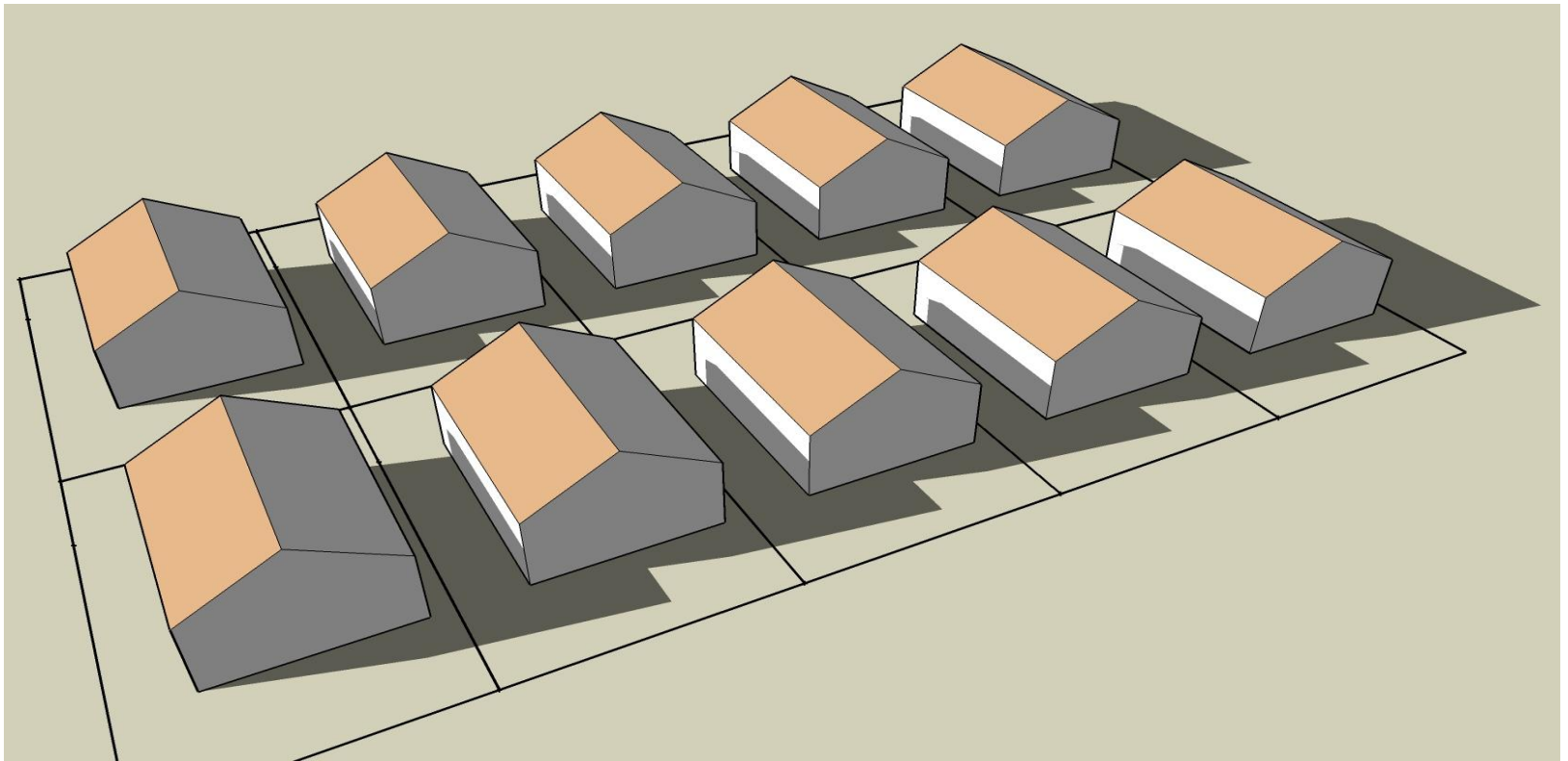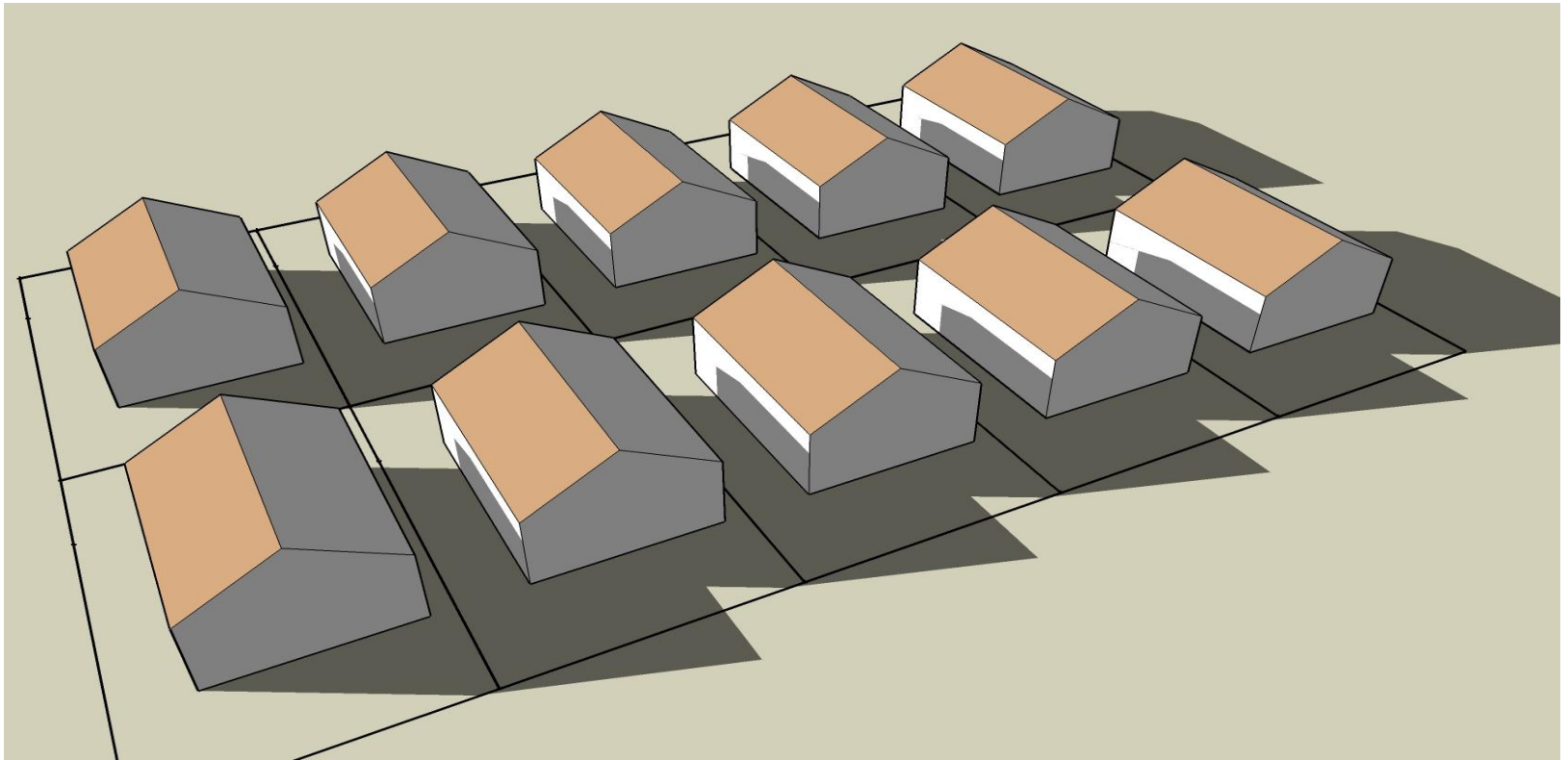
Roof Protection 10 am - yes

Roof Protection 11 am – yes

Roof Protection Noon - yes
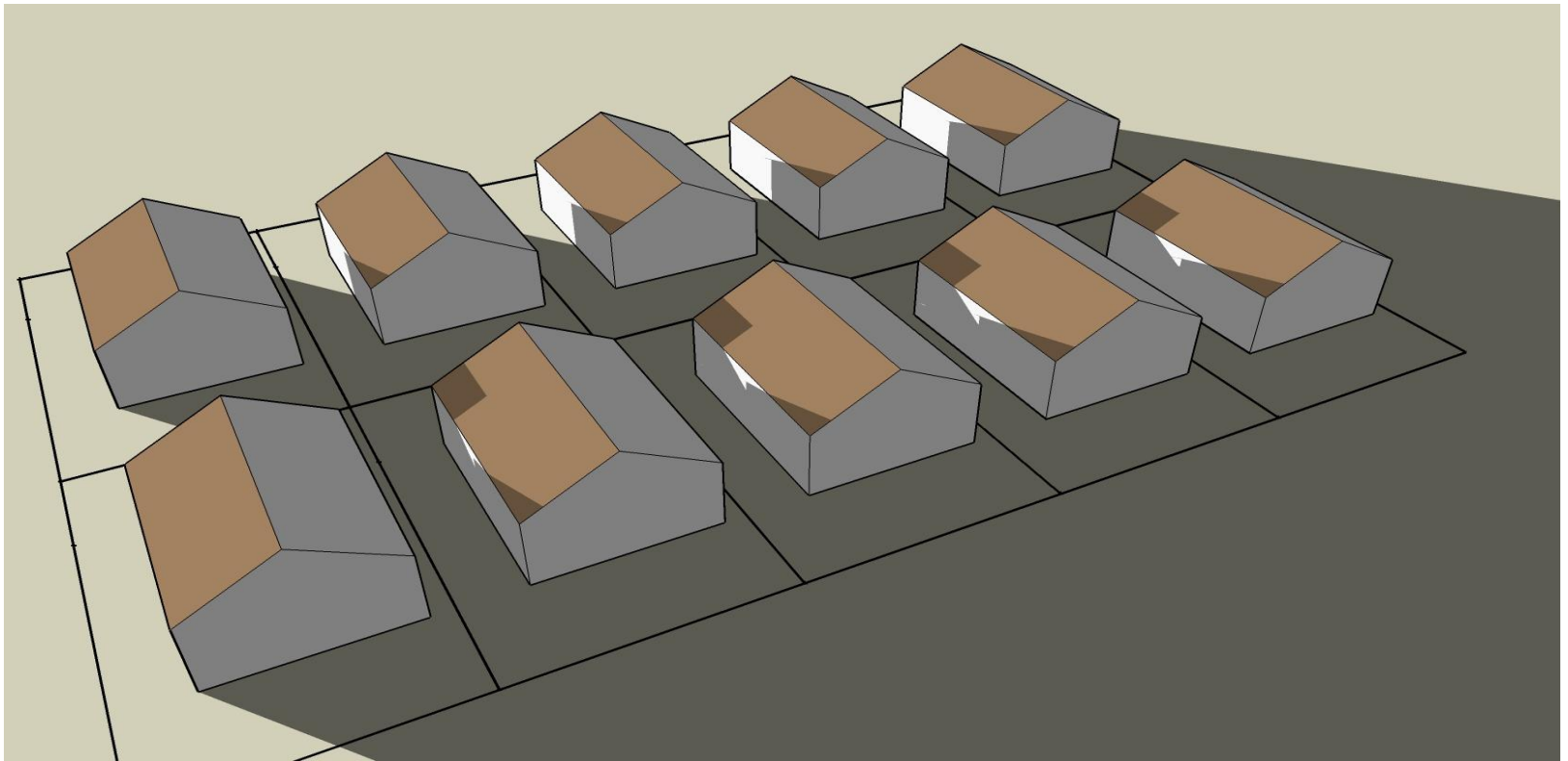
Roof Protection 1 pm - yes

Roof Protection 2 pm - yes
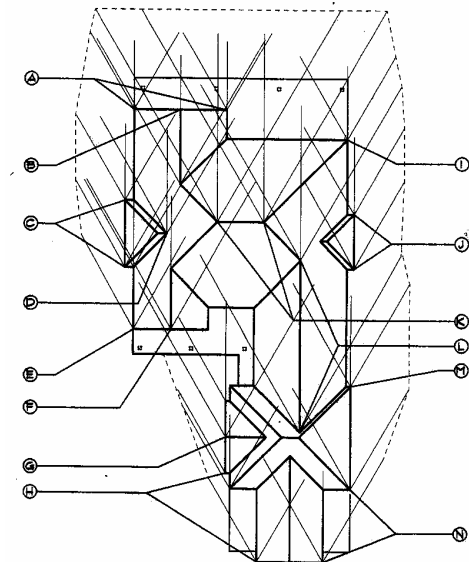
Roof Protection 3 pm – n.a.

Roof Protection 4 pm – n.a.

Boulder's Approach

- Building permit analysis:

    – Protect adjacent building envelopes

    – South roofs, walls, yards - low density

    – Roofs only medium / high density
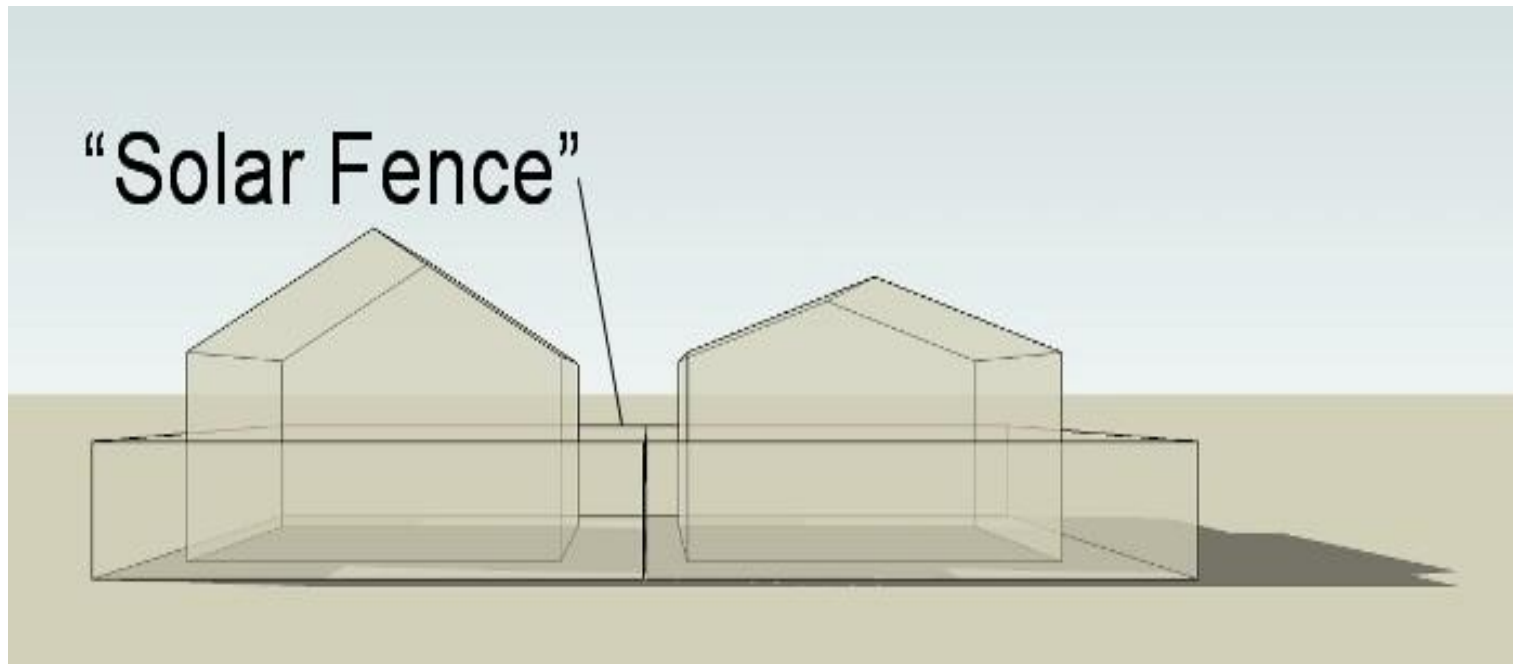
    – "Solar fence" concept

SOLAR SHADOW KEY

| BUILDING ELEMENT	HT ABV MAIN FLR	HT ABV GRADE	10 AM SHADOW	12 NOON SHADOW	2 PM SHADOW
A	19.4'	19.6'	19.8	18.2	19.8
B	26.2'	26.4'	32.4	28.8	32.4
C	19.4'	20.8'	22.1	17.0	22.1
D	22.4'	23.8'	29.9	23.0	29.9
E	19.4'	20.9'	20.0	17.8	20.0
F	28.0'	26.5'	32.7	29.0	32.7
G	24.9'	27.0'	39.7	32.0	39.7
H	19.4'	21.6'	27.7	19.0	27.7
I	19.4'	20.2'	18.8	16.4	18.8
J	19.4'	20.6'	19.4	17.2	19.4
K	31.8'	33.0'	55.6	41.9	55.6
L	26.6'	29.2'	48.2	34.4	48.2
M	19.4'	22.0'	26.5	20	26.5
N	19.4'	22.0'	26.5	20	26.5

Shadow Analysis

- Can't shade more than "Solar Fence"

Shadow Analysis

Both house shadows exceed solar fence
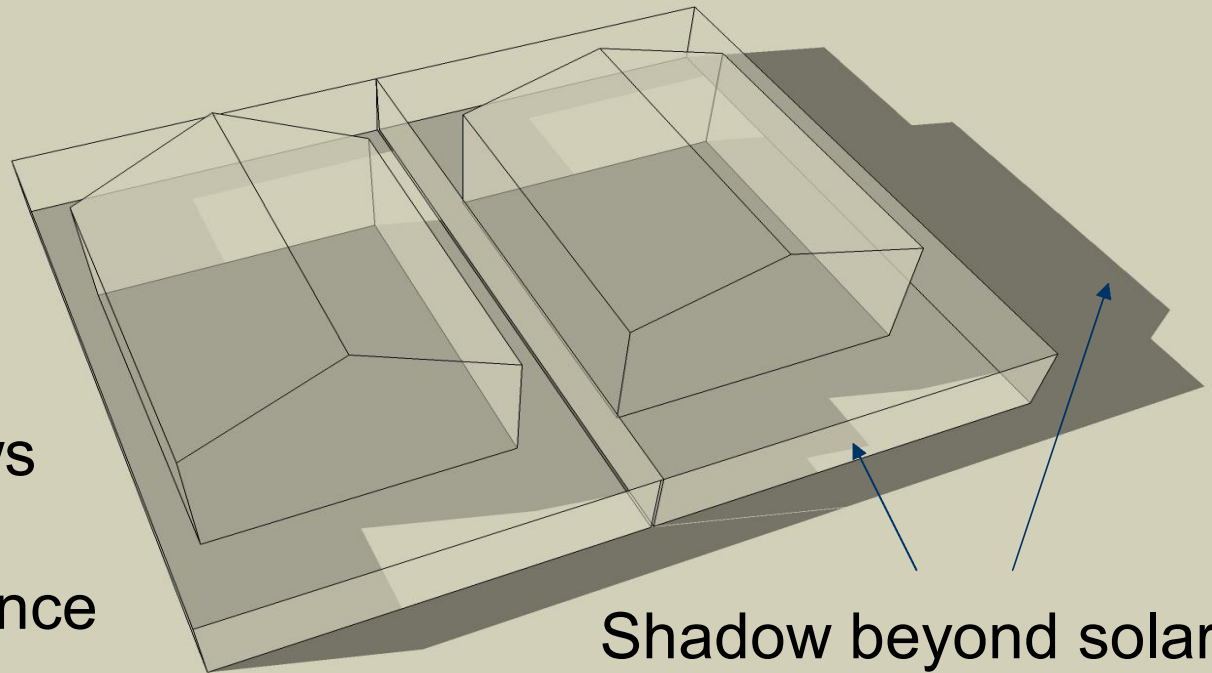
Shadow beyond solar fence

Other Features…

- Trees <u>can</u> be considered in analysis

- Solar "exceptions" – if minimal impact

- Solar Access Permits – record restrictions on adjacent lot to protect an existing solar system
  - Can limit neighbor's structures or trees

Issues

- <u>Off-site analysis re: topo / lot configuration</u>
    - Complex roof plans = complex analysis
    - Bulk plane over lot would be easier

- <u>Neighbors use to prevent McMansions</u>
    - Contentious
    - Time consuming

- <u>Doesn't require solar use</u>
    - Solar installation market - driven

Summary – Solar Reg Options

- <u>Multiple techniques available</u>
  - Subdivision
  - Bulk standards (bulk plane)
  - Building design

- <u>Preserves solar potential</u>

- <u>Solar system use - market or regs</u>