Microclimate Adjustments (continued):

Simple Architectural Alterations:

Solar heat gain can be easily reduced through use of shading devices and building orientation. Simple alterations to option A of the developer's house plans have been illustrated below. Simple rules to follow:

1. Direct sun occurs on the southern facade. Horizontal shading can be implemented above windows to reduce solar heat gain.
2. Northern facade can take advantage of natural day lighting with access to soft sun. Horizontal shading devices should be used if desired.
3. Vertical shading devices should be implemented on eastern and western facades to reduce solar heat gain.

Additional Passive Techniques to be Considered:

Architectural form can greatly decrease energy costs by reducing Air Conditioning needs. Two techniques ideal for the Hawaiian climate are stack ventilation and cross ventilation. By controlling air flow through use of fenestration, indoor air temperature can be greatly reduced.

Cross Ventilation:
Through use of fenestration, wind will travel through the building from the windward side to the downwind side. This effect is made possible due to the pressure differences between upwind and downwind sides of the building (upwind being high pressure, and downwind being low pressure).

Cross ventilation implemented in Palamanui:
- Ventilation inlet should be on the Northeast facing facade to maximize air circulation through the home.
- Ventilation outlet should be on the Southwest facing facade. Opening should be greater or equal to ventilation inlet opening.
- Open floor plans are desired to allow optimal opportunity for air flow

Current techniques common within Hawaiian architecture:
1. Dog-trot house: cross ventilation implemented through the use of wrap around porches created for indoor and outdoor living.
2. Floor to ceiling sliding doors to open facade to the outdoors while allowing optimal opportunity for air flow into the interior. Ceiling fans can be used to increase air flow.

Stack Ventilation:
Stack Ventilation is a passive cooling technique which uses natural convection through principles of air stratification. As cool air enters the building at a low level, warm (less dense) air will rise and exit through a high point opening.

Stack Ventilation implemented in Palamanui:
- Building should be oriented towards prevailing winds (northeast) for maximum air flow.
- Ventilation outlet should be at a point 2x the height of living space for optimal cooling. Therefore most living program should occur on the first floor for a comfortable interior living environment.

Further steps: Propose several schematic designs of residential homes using passive techniques researched.