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# Farrar Green Home

*Concepts and Requirements*



Rhonda & Nigel Farrar

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## *Concepts and Requirements*

### Overview

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Rhonda and Nigel Farrar have purchased a 2 acre parcel to build their green dream home. They are looking to design and build the home that they will live in for the rest of their lives. They want it to be a beautiful, energy efficient and functional home that is a model for green design and building.

This document contains the details of their concepts and requirements for their home.

### The Land

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View of the Building Pad

The lot is L shaped, on a hill facing west.

The building pad of ~4500 sq.ft. is level and graded and approved for the construction of a 3374 sq. ft. home. A home of ~3000 sq.ft is planned.

The lot has been approved for a septic tank and leach field for a 5 bedroom home

A 1 1/2" water meter is installed on the site and there is currently irrigation watering the slopes above and below the building pad. The water pressure at the site is 70 psi.

All other utilities, gas, electricity, telephone and cable, are available at the street.

## Overall Requirements

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The following provides an overview of the requirements for the home.

### Important Design Elements

#### Lifestyle

Rhonda and Nigel enjoy entertaining, gardening, cooking and quiet evenings at home. Rhonda works from home. Rhonda and Nigel regularly have houseguests. Rhonda also hosts cooking parties which include many people working in the kitchen together. Rhonda and Nigel spend the majority of the time together in the house in their family room or Rhonda's office, where there are two desks and workspaces.

#### Layout

The concept is for an open and airy two story home with 4 bedrooms and a 3 car garage. The entrance to the home will be a courtyard; an attached garage will be concealed at the side of the home. The building pad will contain the home, a west facing patio with infinity edge pool, with space for a large vegetable garden, an herb garden, a clothesline and a small chicken coop designed in the same style as the house on the north side. The pad area will be fenced with a low fence designed to prevent a small dog from escaping. The approach to the house will be beautifully landscaped with an exceptional collection of fruit trees and flowers.

#### Design features

Rooms will include a Master Bedroom/Master Bathroom, with nearby exercise room, Guest Room (mini-master suite) with bath, Granny Flat, Office (also serving as the 4<sup>th</sup> bedroom), Kitchen (with walk-in pantry) and Breakfast Nook, Laundry Room (with outside access), Dining Room and Family Room. The entry courtyard will replace a traditional living room. The layout of the house will be designed to maximize the beautiful lake view.

Landscaping will include a Pool/Spa (with swim current, dark bottom, motorized cover), Outdoor Barbecue and Fireplace, Fountains, extensive plantings of fruit trees, berries, and flowering and fruiting bushes. Hillsides on both sides of the driveway will be terraced to maximize planting areas and to provide a tree lined driveway.

## Smart Design<sup>1</sup>

We would like to have a Smart Design, integrated with the landscape, using sustainable and recycled materials and designed for longevity, flexibility and an indoor/outdoor lifestyle.

- **Design to use less:** We would like a design that makes the space feel larger than it is, using outdoor rooms as much as indoor rooms so that both become a part of the house; a design for flexible function so that aspects of the home can serve more than one purpose and adapt to changes in future use; a design that through the use of large and numerous windows maximizes the light inside the house and minimizes the need to turn lights on during the day.
- **Design to collaborate with the environment:** We want to orient the home to maximize both views and energy efficiency and try to avoid extreme excavations or other highly invasive procedures.
- **Design for longevity:** The home should be designed to last a long time with low maintenance, using high quality materials and building practices.
- **Renewable and recycled materials:** We would like to design and build using high quality, eco-friendly elements including: sustainably harvested materials such as bamboo and cork, FSC certified wood and, when possible, incorporating recycled materials.

## Energy Efficiency

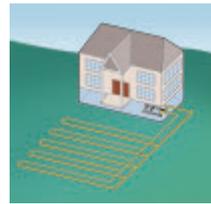
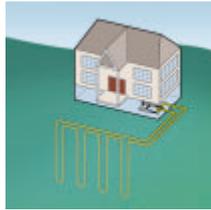
We would like to investigate the possibility of some level of LEED certification and qualification for the County of San Diego Green Building Incentive Program. With the installation of a geothermal heat pump that runs off of electricity from photovoltaic cells, the house has the potential to be carbon - neutral. This would be an excellent objective.

- **Efficient envelope:** Efficient insulation, solar chimney, and triple-pane/low-E windows to trap heat when it's cold outside and cool air when it's hot outside.
- **Efficient fixtures:** Energy efficient lighting systems.
- **Efficient appliances:** Energy Star certified appliances.
- **Efficient heating/cooling system:** We would like an efficient primary heating/cooling system, perhaps using a geothermal heat pump. Geothermal heat pumps appear to be the most efficient source of heating and cooling. The earth at 6-8' deep remains at a constant temperature year round and can be used as a heat source/sink for efficient heat transfer using a heat pump for both heating and cooling. Such systems are reliable and long lasting with little maintenance; they are warranted for 50 years and expected to last for hundreds. Heat pumps may be designed in 3 ways; open loop, using pond/lake/well water or closed loop in either horizontal or vertical configuration. The

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<sup>1</sup> Source: Some concepts from Michelle Kaufmann Designs: <http://www.mkd-arc.com/company/ecoprinciples/principle1.php>

horizontal configuration is less expensive to install, due to shallower trenching requirements, but requires sufficient land area. A 3-4 bedroom house typically requires a 300-400' loop buried at 6-8' deep at a total cost of ~\$5k (2-3x a conventional heating/cooling system). The loop must be well separated from the septic leach field due to high temperatures during the cooling cycle. We would like to consider whether a geothermal heat pump is an appropriate choice for our climate and which configuration is most suitable for our lot. Hi-velocity/mini-duct systems for energy efficient heating/cooling distribution, and ceiling fans, house fans, and cool roof systems for energy efficient cooling should also be considered. Sun shading, using low tech sliding wood sunshades, Lutron shades, trellises, and screens should also be considered for reducing cooling requirements.



- Waste heat from the heat pump should be transferred, via a desupersaturator, to preheat water in the water heater. This is more efficient during the cooling cycle but can be used for preheating water even during the heating cycle. Conventional modern water heaters are quite efficient and it is unlikely that the energy savings of alternative water heating approaches will pay for the extra cost of the equipment/installation at any time in their life. However, we would like to consider alternatives such as solar hot water heating, central (or point-of-use) tankless water heater(s) with circulating pump, and on-demand hot water using stored energy pulse system.
- **Energy monitoring system:** Comprehensive mini-zone monitoring and control system for temperature, energy use and other systems.
- **Alternative energy sources:** We would like to generate a significant portion of our energy needs using renewable energy sources. The goal is to provide ~90% of the energy requirement of the home including two plug in hybrid cars. We would like to consider alternative energy sources such as photovoltaic solar (attractively installed either on the roof or on ground mounted panels) and wind turbines taking advantage of the coastal breezes for power generation. We would like a solar design optimized for orientation and angle of inclination for maximum efficiency. We would like to be sensitive to bird safety for wind turbines.



## Water Conservation and Quality

Water is a scarce resource in Southern California. We want a home that is designed to use water wisely in both the home and garden and to collect and/or re-use as much water as possible. High quality water is required for drinking and cooking. Good quality water is sufficient for the rest of the house. In San Diego, water softening of some kind is typically required.

- **Well Water:** Ideally, we would like all of the water for irrigation to come from rainwater catchment and/or a well. The county requires a well to be at least 100 horizontal feet from any septic leach field. This may be difficult to achieve since the entire neighborhood relies on septic systems. There appear to be no wells in the nearby neighborhood.
- **Reduce water intake:** Use elements such as dual flush toilets, low flow showerheads, and consider point-of-use tankless water heaters.
- **Re-use water:** Rain-water catchment systems to collect rain water for irrigation. A gray water collection system would be desirable. However, gray water appears to be a complex system to design and maintain. The system cannot use kitchen sink/waste disposal output and even using sink/shower/laundry waste water introduces a large quantity of material that requires filtering and frequent maintenance of the filters. In addition, the output irrigation piping must be buried at least 3' deep making it difficult to troubleshoot clogs and other problems. It is reported that many gray water systems are abandoned after 3-5 years. In addition, for a 3-4 bedroom house, it is expected that this waste water would only provide ~1500 gallons/month (50 gallons/day). This is a very small fraction of the total irrigation requirement. The waste water must typically be used within 24 hours so the system would have to continue operating, or be diverted to the septic system, during rainy conditions. However, diverting this volume of water away from the septic system under normal conditions would prolong the septic life. One possible gray water option is to use the waste water from a large scale reverse osmosis system, if this is selected, since this is much cleaner.
- **Minimizing storm water run-off:** Use impermeable materials for maximizing runoff into the rain catchment system.
- **Irrigation:** Efficient irrigation system using primarily drip lines, with centralized control and wireless remote control of valves. Central control should have a weather sensor or internet weather access.

The choice of an optimum water softener is not clear to us. Ion exchange water softeners are undesirable due to the frequent discharge of waste brine. Also, if this was used on all input water (hot and cold) the resulting drinking water would require further processing to be usable. This would typically use a Reverse Osmosis (RO) system. RO is wasteful, discharging 4-5 times the water actually used, unless used in conjunction with a gray water system (as described above). Alternatives such as carbon filtering may also be considered.

## Healthy Environment

We would like to use design features and materials that provide as healthy an environment as possible.

- **Non-out-gassing materials:** No VOC paints and formaldehyde-free materials.
- **Air filtration:** Hepa air filters and natural ventilation with air mixture systems to protect against stagnant or stale air.

- **Insulation:** Mold resistant insulation.
- **Hard Floor Surfaces in most areas:** For protection against allergens and molds that might thrive in carpeting.

## Detailed House Requirements

### Master Bedroom & Bath

The upstairs master bedroom should have an unobstructed lake view from the bed. A small balcony would be an attractive feature if it did not obscure the view. The stairs should be designed to possibly accommodate a lift, should one be required in future. The bedroom should have high a ceiling and include a small seating area or window seat, and perhaps built in bookshelves and a fireplace. It should include a large walk-in closet with skylights to provide natural light, but keep out the heat and the sun's rays that will fade clothing. The master bathroom should have dual sinks, a large double shower, large non-Jacuzzi tub and separate toilet and bidet room. A heated towel rack may be considered. There should also have a lake view from the bath or shower if possible. An outside staircase from the Master suite to the spa area at the back of the house would be attractive, if this is possible.

### Exercise Room

There should also be an upstairs exercise area, perhaps adjacent to the master suite. The area should be big enough to accommodate a stationary bike, elliptical machine and ample floor space for three yoga mats. Perhaps an attractive open room/loft at the top of the stairs would be appropriate.

### Guest Room (2<sup>nd</sup> Bedroom)

The large downstairs guest room should be designed as a smaller master suite, with a walk in closet, bathroom with walk in shower and dual sinks. If practical, a separate toilet room could double as the powder room. Access to a small private patio would be desirable.

### Granny Flat (3<sup>rd</sup> Bedroom)

An upstairs "granny flat" (perhaps over the garage) with a large room, full bath, countertop area for microwave and fridge and a separate entrance from the outside is desired. The room will be furnished to have maximum flexibility for long term guests, grandchildren and ultimately for live in care, should it be required.

### Office (4<sup>th</sup> Bedroom)

The downstairs office should have a beautiful view and open to the outside patio. It will require room for two desks and built in filing and storage cabinets. It should be adjacent to a bathroom and small closet and be useable as a 4<sup>th</sup> bedroom.

### Kitchen

The kitchen should be large and open with space for two or more cooks working together. It should be integrated with the family room and be the focal point of the house. It should include an island and/or counter sitting area and perhaps pass throughs to the patio and dining room. There should be an adjacent breakfast nook which does not separate the kitchen from the family room. The gourmet kitchen appliances should include two ovens with a warming drawer, a 5 burner cook top (in the counter), and two dishwashers

on either side of the sink, a trash compactor, recycling bins, a large refrigerator freezer, an under-counter wine fridge and a walk in pantry. The pantry should be close to the garage door entrance. The cabinetry surfaces should be taller than standard to accommodate two tall cooks and designed to maximize the storage space in the kitchen, with pullout drawers and other space saving features.

### Family Room

This should be a spacious room with high ceiling that is integrated well with the kitchen for entertaining indoors. It should include window-walls and perhaps built-in cabinets/bookshelves and a fireplace.

### Laundry/Mud Room

A large laundry room with a door to the outside and convenient access to an attractive shaded clothes line is required. The laundry/mud room should also be one of the entrances from the garage and have room for storing shoes, jackets, gym bags and be the central place for sorting and filing incoming mail. A laundry chute /trolley to/from the master bedroom would be a very cool feature. It should include a sink, a clothing drip pan (or perhaps a rail over the sink) and a built-in drop-down ironing board. Space for a small chest freezer should also be included.

### Garage

The 3-car garage should be large enough to accommodate two plug-in hybrid cars and a small truck. There needs to be a work bench and adequate storage space for 4 bicycles, two kayaks, and other storage items. An area for garden equipment, ladders, pruning gear, weed whackers, wheel barrow, etc., is also required.

## Landscape and Gardens

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A key element of Rhonda and Nigel's dream green home is the design of the landscaping around the home and to make the landscape a significant asset to the home. We would like to make full use of the two acre parcel and integrate the design of the house with the design of the landscape and garden. The house should be designed to blur the boundaries between inside and outside. We would like to plant a very wide variety of fruits, fruiting vines, berries, ornamental trees, herbs, flowers and rare plants. We would like the landscaping to create privacy in and around the house. A partial list of the desired plantings is included in Attachment 1.

The goal is to provide a beautiful approach to the home by landscaping the driveway and hillside area and to provide a welcoming oasis with a courtyard entrance to the house. The landscaping should be designed to provide adequate privacy for the home, and shielding from less desirable view aspects, while not limiting light. The courtyard should invite guests to the backyard area and enhance the lake view with plantings that are attractive and unusual. Outside lighting should be inviting and enhance the features of the house. This could be low voltage or solar.

We would like to be relatively self sufficient, growing the majority of the fruits and vegetables that we require. Although we will not apply for organic certification, since the runoff rainwater we will be using will not be certifiable, we will be growing organically and sustainably. We will apply for Certified Naturally Grown certification. Excess produce will be donated to local food banks and sold to local Slow Foods

restaurants. Our intent is to minimize the use of city water by using gray water, where possible, and by installing a well, if possible. Overall landscape design should attractively group plants by water requirements to simplify the irrigation design. Consider terracing the slope on the east side of the property and on the west side of the driveway to maximizing the planting area.

### Courtyard Entry

Provide a serene walled garden as the entry to the home and provide easy access to the back yard for entertaining. The courtyard should have a nose-high wall on the two sides and a lower wall and gate to the backyard area. The inviting courtyard will have an outdoor fireplace, a water feature and lush landscaping. A balcony overlooking the courtyard from the second floor would be desirable.

### Pool/Spa

Provide a beautiful and functional pool that is an integral part of the design of the house, ideally west facing and infinity-edged. The pool should have a dark bottom and an automated cover for optimal solar heating. The pool should be designed for year round energy efficient heating with a target temperature of ~85deg from April – September. The pool should be designed with a “FastLane” from Endless Pools, which will provide a current for swim training. In this case, the PV solar output should be sized to provide the considerable power needed for this device (5-6kW). A spa may be desirable, either separate or integrated with the pool, with supplemental heating for a spa to achieve a maximum temperature of ~110F.

### Outdoor Cooking

A functional outdoor cooking and entertaining area that includes a gas grill, a side burner, a small sink, a large counter space for serving food and adequate outdoor lighting with easy access from the kitchen.

### Kitchen Garden

A large, ~10'x20', rabbit and gopher proof, kitchen garden located near the kitchen is required. This garden will be used to plant various vegetables throughout the year. The garden should be accessible by a small truck and be tillable with a small rototiller. The irrigation system should be a roll-up drip system with each row controlled by a valve that will allow separate irrigation control. A garden shed, perhaps built into the east hillside would be a desirable feature.

### Herb Garden

An attractively designed herb garden planted near the kitchen that is planted with all common (and uncommon) herbs.

### Flower Garden

A wide variety of attractive flowers along the driveway with some suitable for cutting for household bouquets. An area for planting bulbs and other annuals should be included in the design.

### Native Plant Garden

We would like to plant a section of the garden with native plants that are attractive and fit in with the overall landscape design.

## Fruiting Trees and Vines

Design an attractive landscape including all of the desired plants with adequate space for them to grow. A varied design rather than an “orchard” like design is preferred.

## Chicken Coop

A small attractively designed chicken coop and run for 4-6 chickens near the vegetable garden is required. The chicken coop should have its own automatic watering system to water the chickens. The chicken manure will be used to fertilize the vegetable garden. The chicken coop and run will be designed for easy cleaning and egg collection.

## Other Home Features

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- Two entrances from garage to house. One garage entrance to laundry room, with filing for mail and recycling bin. Second to kitchen and near pantry.
- Central vacuum system
- Central automated home control system, including integrated heating/cooling, power, security, pool pump/heat, irrigation, shades, lighting and audio/video management (both indoor and outdoor). This should include through-house wiring for communications (including phone and Ethernet), audio (with built-in speakers for Family room, Master Bedroom and Patio), security (including motion sensing lights, cameras, alarm system and intercom to gate and Granny flat), irrigation (with internet based weather control) and wiring for central independent lighting and outlet control. Internet based management and multiple control panels through the home should be provided to access the system.