

PERMACULTURE DESIGN

Latitude 35° 16' S Longitude 174° 10' E

2.106 hectares (5 acres)

Council Zoning: Mixed- Rural Production and Coastal, Outstanding Landscape

1. CLIMATE

Subtropical

Special characteristics: Being at the end of Purerua Peninsula in the Bay of Islands the property has water on three sides, located from just above sea level (18m) to low hills (28m). The highest peaks of the Mataka range (with the apex of Mt Pocock at 258m) are to the east of the property, which is also the direction of the strongest winds (cyclonic winds come from this direction). The presence of the higher peaks probably creates a rain shadow effect as the area has (anecdotally) 30% less rainfall than the mainland, and also accelerated and consistent wind. Light frosts accumulate in the low lying areas during winter between 1-5 days on average (observation).

The Kerikeri area has long been a centre for horticulture due to the mild climate and volcanic soil, main crops being citrus, kiwifruit and avocado. There is also the largest vineyard in Northland situated close to the property.

Climate Data (per annum 2008-2018):

Average Max Temperature: 19.3C

Average Min Temperature: 12.3C

Average rainfall: 998.9 mm

Average days with rain: 161

Average frost days: 0.3

Average wind speeds: 10,7km

Wind directions:

N 8 %

NE 9 %

E 13 %

SE 6 %

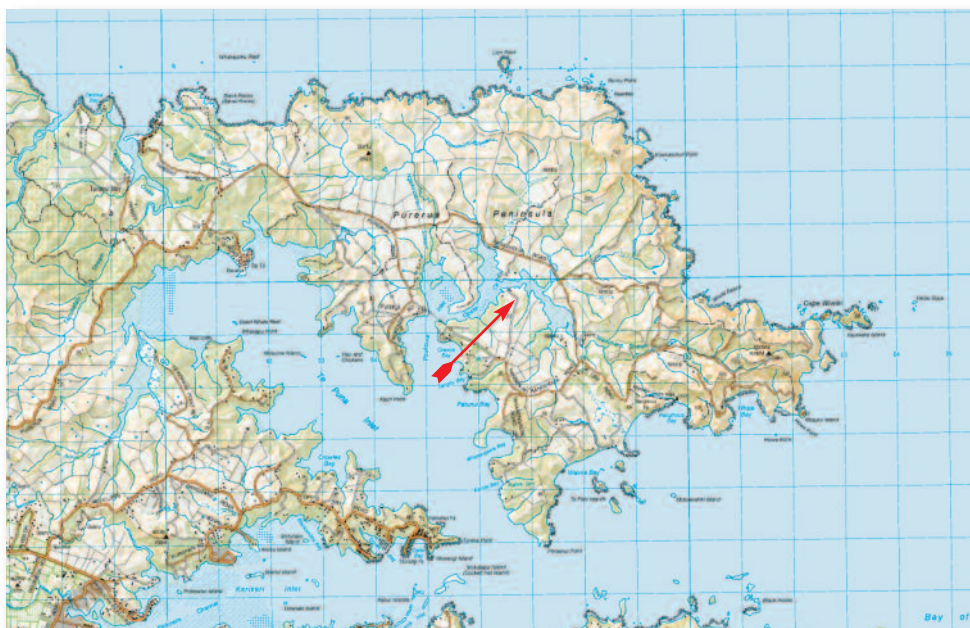
S 18 %

SW 15 %

W 21 %

NW 10 %

*Note: Data from weather station is at 46m



2. SOIL & TOPOGRAPHY

General Area:

"A very powerful and substantial headland form that acts as a landmark over a large inland area and area of coast. Serves as the northern gateway to the Bay of Islands, and Kerikeri/Te Puna inlets. When seen from a distance, Purerua has a very simple, bold signature comprising the loom of the landmass overlaid with a simple pastoral cover. In summer that grassland dries off to a very graphic golden colouring."

Purerua Peninsula has some of the highest number of kiwi calls per hour recorded in Northland. The shrubland areas are important for kiwi and the nearby wetland areas are potentially important for spotless crane, bittern and fernbird. The area supports several threatened and regionally significant species of shore and wetland birds, and is a representative site for manuka shrubland.

Geology: Valleys and coastal hill slopes in hill country of Waipapa Group greywacke.

Soil Types: Marua light brown clay loam, Te Ranga steep land soils, light brown clay loam and sandy clay loam.

Specific property: The property is bisected by a water course that drains from a long gentle slope over a kilometre long adjoining to the SW (in meadow and regenerating gorse). The property has predominately hard-packed clay soils in the N-NW sector and slopes, and sandy clay loam soils with some isolated clay areas in the SW (NE facing).

There is a commercial feijoa orchard on the adjoining property on the SW (NE facing) slope.

The property was previously part of a large sheep station for many years, was subsequently left fallow and overrun with invasive species, predominantly gorse, but also woolly nightshade, moth vine, lantana and californian thistle. It has also been burned off, in attempts to eradicate the gorse. Since purchase the native bush has been allowed and encouraged to regenerate, pasture has been improved for horse(s), a dwelling built, and food forest, tracks, shelter belts and garden have been started.

There are several tracts of large volcanic rock formations present on the property in various areas, some up to 40ft feet above ground and forming interesting land features.

When purchased in 2011 the entire property was covered in mature and regenerating gorse, with mature woolly nightshade along the water course. There were some small regenerating kanuka and manuka appearing through the gorse block. There was a remnant of pasture in the N sector slope. A house site platform was landscaped along with a raised berm for shelter belt on the E-SE boundary.

WATER

There is no permanent water on the site, although underground water may be present. The neighbouring property has a bore, access to which has been offered if needed.

There is also a spring fed dam in the neighbouring (vacant) land adjoining to the SE.

In rain events water flows down the water course then floods the low point in the valley, fills the neighbouring dam and eventually flows into the inlet. Water also flows down the cleared SW slope to the valley and water flow has also been redirected on to the property from the neighbouring property to the west.

Two small dams have been formed, one above the house on the water course (for gravity feed to the food forest situated downslope along the water course), and the other in the SW corner. This dam is shallow due to the presence of a rock shelf. Both dams dry out over prolonged summer dry spells which typically range from October - March, and can extend into April and May.

House water is collected off the roof and stored in a 30,000 litre tank, then pumped to a header tank and gravity fed to the house. Water is heated by a solar system (thermo-cycling) augmented by wetback from a wood-burning stove in the winter.

A self-contained dry composting toilet is used as the main water-saving device and grey water is directed to the back of the house and down to a banana circle (in progress).

Water has been an issue with maintaining a kitchen garden throughout summer as the gravity fed system is not sufficient for a sprinkler, with drying winds and insufficient shelter, making watering essential but hand watering ineffectual.

CLIENT

A couple aged 68 (male) & 54 (female) with a 15 year old daughter. He works 3 days off the property locally doing mechanical repairs and is semi-retired, she works from home as a self-employed graphic designer.

Critical Criteria:

Low maintenance, animal-free system. - they'd like to spend time away when their daughter leaves home in approx three years time. They don't want to be reliant on external labour, woofers etc
Low Budget - the couple have a limited income.

Aesthetic values- one client is an artist and values working from home, views and natural beauty are very important.

They aspire to be self/sufficient as far as is practical with above limitations.

The want to generate income from the property.

Skills backgrounds include landscape gardening, plant propagation, graphic design, photography, commercial and fine art, mechanical maintenance, marine background, blue water sailing (yacht is moored near the property).

Intention is to put the land into a trust to pass on to descendants eventually.

Clients have knowledge of permaculture principles, having created a foodforest and passive solar off grid barn house (work in progress) themselves.

40ft container on property for possible conversion to workshop/ studio or alternative accommodation.

Classic 17ft caravan on site needing renovation.

Secondary cabin/caravan site identified and partially cleared on the SW (NE facing slope).

MARKET

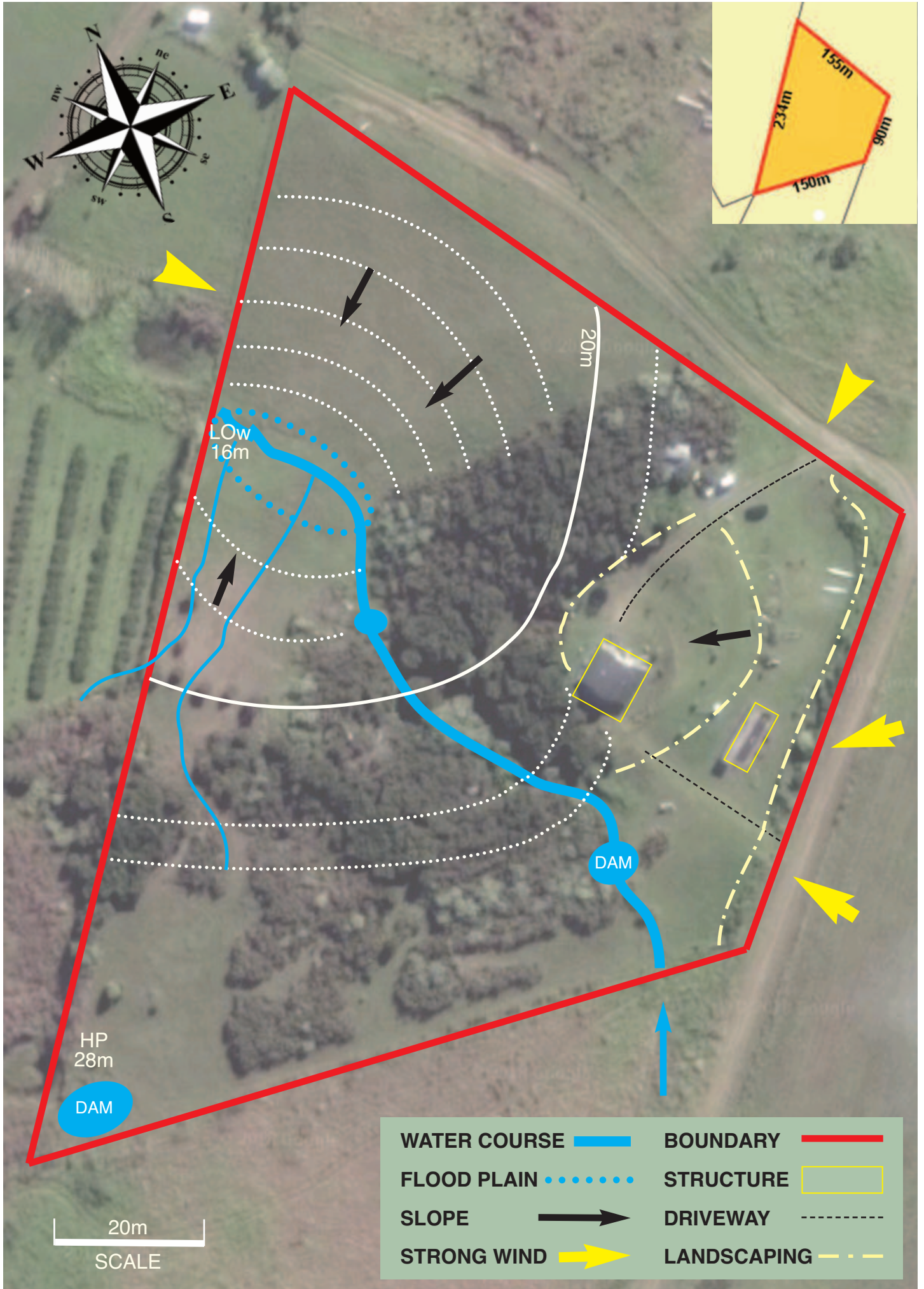
The nearest town is at Kerikeri (a small historical, market and tourist town of approx. 7,000 (permanent population), approx. 30km away, however the road includes 12-13km of gravel so the trip takes 35 mins. There are two weekend markets; a small Farmers Market on Sunday, and a larger mixed market (some undercover) The Packhouse Market, on Saturday.

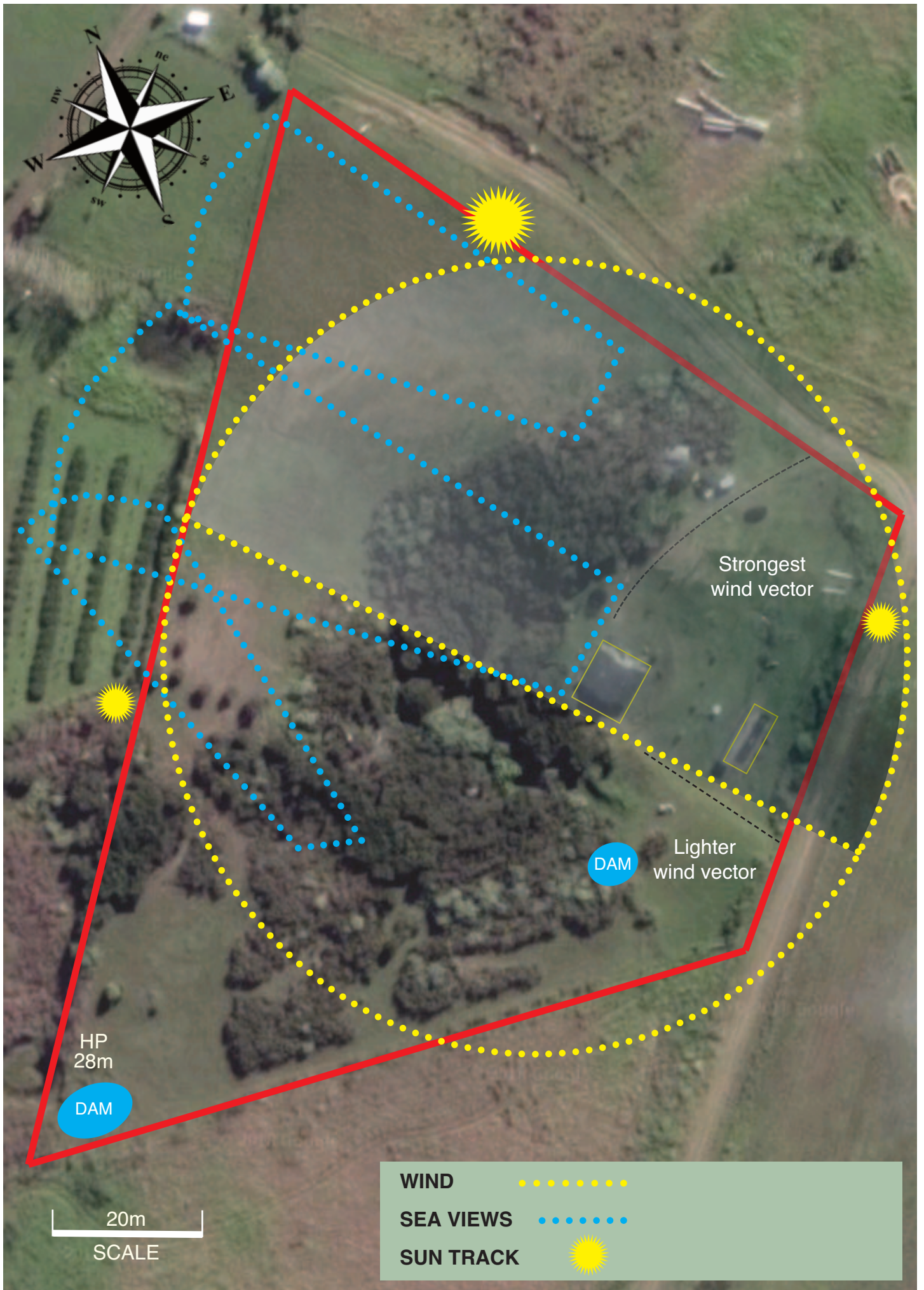
Rangihoua Heritage Park (incorporating Marsden Cross memorial) is close to the property and becoming more frequently visited, but the area is isolated and there is no passing traffic.

The property is served by a 6 day a week rural mail service so a mail order business is a possibility.

The property has a legal right-of-way access to the Poukoura Inlet and the wider Bay of Islands, but the inlet is tidal and access is only possible from half-full tide.











IMPLEMENTATION OF PERMACULTURE PLAN:

OVERVIEW: The plan is flexible to allow for a number of different scenarios depending on what combination of commercial options prove viable. For example Zone 3B bush crops are positioned so they could be replaced by aquaculture ponds if that proves to be a better option. The exact order of implementation will depend on finances, and whether self-sufficiency or income becomes the most urgent priority.

IMPORTANT: Option 1 (most likely use) is shown on the large scale A3 design as outlined, and if appropriate other options are detailed in the following pages.

ORDER OF WORK:

1. Establish all dams, irrigation line to Zone 2, and swales for Zone 3 (Hired digger work)
2. Plant shelterbelts and windbreaks
3. Continue to establish Zone 1 plan (gardens, greywater, deck, parking etc)
4. Instigate larger scale plant propagation area in Zone 2
5. Continue with development of Zone 2 Foodforest, swales, clearing and planting
6. Mushroom trial using hay from Zone 3-4
7. Trial possible commercial crops
8. Trial aquaculture in the mature dam (SW corner)
9. Establish broad beds for annuals Zone 2 (S of container)
10. Clear and plant Zone 3 tree crops.
11. Swale on contour Zone 4 and plant tree crops

ONGOING:

Clear and maintain house sites

Pest species control and eradication

Mowing for mulch and haymaking (grazing-animal free system)

Track maintenance

Plant propagation and nursery upkeep

Seed collection and storage

Research and trial potential commercial ideas

Zone 0

Site is designated high wind area with regular heavy rain events, and also drought-prone.

House is a steel American barn, on a 8m x 11m concrete pad (plus 8 x 4 meters loft area). Sited with the long side orientated to the NW with passive solar heating through large sliding doors NW and NE sides plus additional large windows . No windows on the SW or SE side. Windows on the upper floor NW and SE sides facilitate good air flow in summer heat. Single glazed with floor length thermal curtains. Insulation is above building code requirements. House is warm in winter and cool in summer, but could benefit from extra shading during the hottest months.

House water is collected off the roof and stored in a 30,000 litre tank, then pumped to a header tank and gravity fed to the house. Water is heated by a solar system (thermo-cycling) augmented by wetback from a wood-burning stove in the winter.

A self-contained dry composting toilet is used as the main water-saving device and grey water is directed to the back of the house and down to a banana circle (in progress).

The property is off-grid, with a basic solar power setup with back up petrol generator.

SUGGESTED IMPROVEMENTS

1. Install wind generator and additional solar panels with improved battery storage to reduce use of petrol generator. Integrated system to be relocated to above house site for optimum wind and solar access. Solar panel stand could also be modified so it could be rotated to track the sun.
2. Deck planned for NE- NW sides of house, with underdeck area for storage of recycling.
3. Self-contained composting toilet could be replaced in the long term with a higher capacity external chambered model, allowing longer composting times.
4. Refinement of grey water filtration system through banana circles gravity fed down through gardens. Refine black water disposal system.
5. Internal blind for sun shade for NE facing kitchen window, and external shade for NW bedroom window- either by removable or retractable shade sail or deciduous vine.
6. Install small bathroom window (SW side) for ventilation.



Zone 1

PRODUCTION SYSTEMS:

1. Orchard on slope NE of house. Sheltered from the NE winds by feijoa hedge. Deciduous fruit trees, including pears, plums, nectarines and apples, on mini swales on the steepest parts. Interplanted with tagasaste (N-fixing). Bush crops interplanted such as thornless blackberries, pepinos, cherry guavas, currants, blueberries, as well as Mexican daisy (suppressing kikuyu and butterfly attractant). Understory of cape gooseberries, strawberries, borage, comfrey & chicory (mineral accumulators), californian lilac (N-fixing), marigolds, vietnamese mint, aloe vera, nasturtium, daffodils and other bulbs, wild flowers, yarrow.
 2. Kitchen garden. Terraced on slope NW of house. Sheltered by Zone 5 bush (NE & SW) and by the house (E sector). All season sun. Mostly annual vegetables by season. Intensively managed.
 3. Seasonal beds (all sides) Summer beds for strawberries, raspberries, boysenberries, basil, herbs plucking greens (rocket, cress, lettuces etc).
 4. Dry slope E-SE of house for flowers, succulents, rosemary, herbs.
- Understories can be regularly chopped for mulch and any grass retained in Zone 1 is mown and used as additional mulch for plantings. To the SW of the house compost pits are located in bananas circles and worm bins are under the shade of native trees. Plant propagation and nursery is currently located here, due to shade and wind shelter. Water is gravity fed from a dam and also available via an external tap on the house (W corner).
- Compost, green manure, vermicast and humanure, as well as wild animal droppings replace domesticated animal manure as a fertiliser where required.

ECOLOGICAL INTEGRATION:

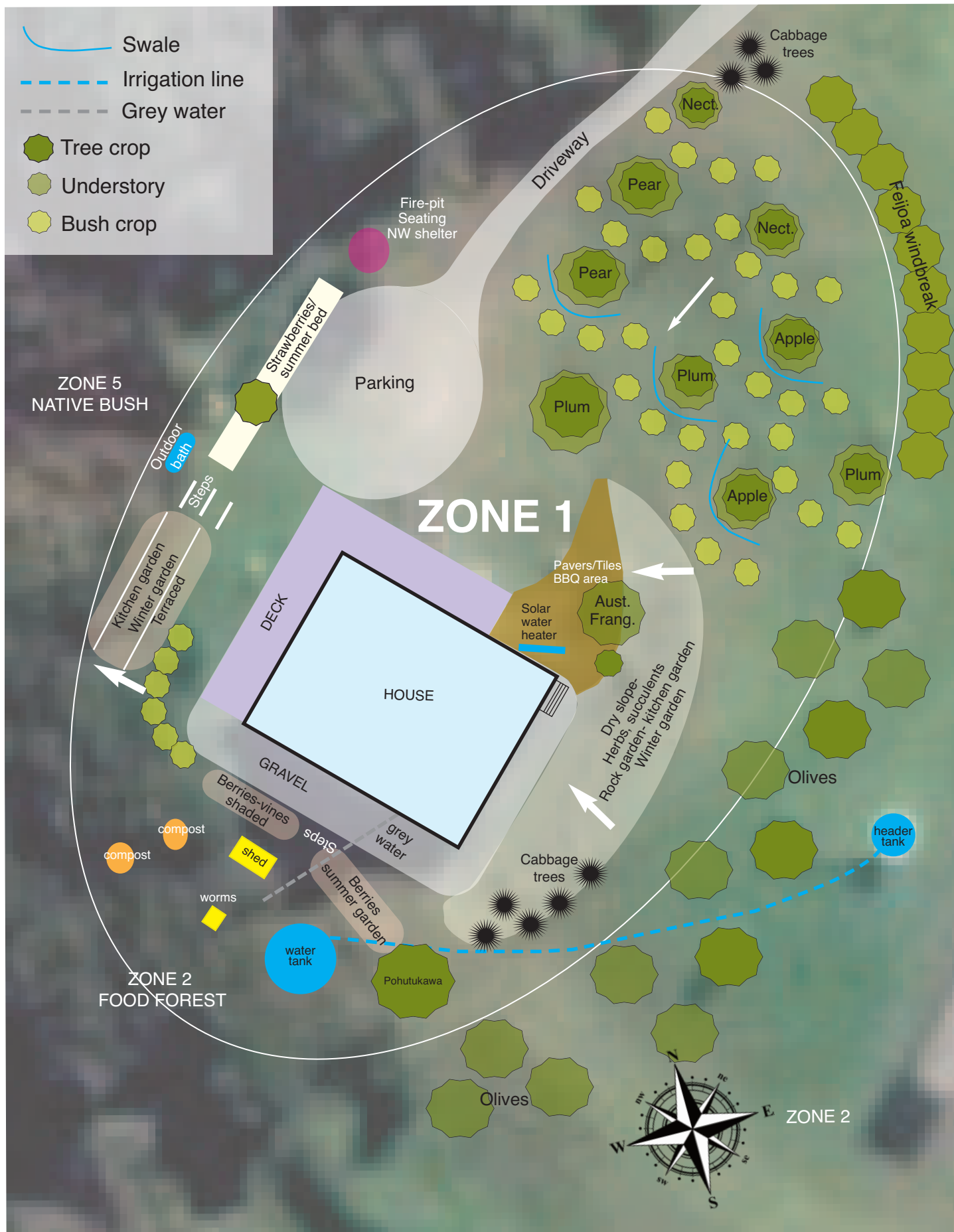
Butterfly attractant and bee-forage species are planted throughout Zone 1 (mexican daisy, borage, marigold, wildflowers, bulbs, herbs).

Specimen hibiscus, Australian frangipani and flax are planted around edges for flowers, scent and bird nectar. Tui, fantail, yellowhammer, quail and wax eye birds are regular visitors.

Zone 5 (native bush) joins and wraps around Zone 1 to the NW-SW. Kiwis live throughout the area and regularly visit at night. They have been seen mating and breeding close to the house and several burrows are identified. Invertebrates, insects and frogs are plentiful. Pest control for rats and mice is ongoing. Possums are generally not present due to large scale trapping in the area (kiwi habitat).

OPTIONS:

1. Deck could be replaced by paved patio at ground level.
2. BBQ area by shade tree NE of the house could be left in grass or a continuation of the gravel, alternatively BBQ area could be incorporated into firepit area in the NW sheltered spot.
3. SE side of house could be roofed over in clearlite roofing to provide an undercover clothes line area and greenhouse or shade house area.
4. The SW side (back) of the house could be utilised for another external room, firewood storage, or plant nursery if structural wind shelter is added.
5. The small orchard on slope could have full width swales (instead of mini swales) with additional plantings along them.
6. Firepit area could be developed with additional seating, solarlights, outdoor table.
7. Terraced kitchen garden could be supplied with grey water from the house via a gravel pit or filtration system.



Zone 2

PRODUCTION SYSTEMS:

FOODFOREST

The foodforest is arranged in layers and guilds to mimic a natural forest system and uses both planted and naturalised exotic species and naturally occurring natives.

Canopy - kanuka, woolly nightshade (can be progressively cut out as larger plants mature)

Main crops- Bananas, cherimoya, peaches, loquat, babaco, avocado, inga bean

Understory- citrus (lemon, lime, mandarin, orange), tamarillo, jerusalem artichokes, coffee, cape gooseberries, hibiscus.

Ground covers- pepino, berries, herbs (parsley, perennial basil, lemon grass), geranium, nasturtium, marigold, sorrel, wild greens, comfrey, land cress, peanuts & liquorice (N-fixing)

Vines- passionfruit, choko, beans (N-fixing), grapes

Nitrogen fixing plants (tagasaste, lupin, clover, californian lilac, kowhai & kakabeak) are introduced to replace gorse as it is progressively cleared. Mexican daisy is interplanted to out-compete any kikuyu or any residual grasses and as a butterfly plant along with swanplant. Whau (native, fast growing soft wood) is interplanted as on-going source of mulch material.

Foodforest support plants are regularly chop-and-dropped to build soil and fertility and promote growth (syntropy). Compost, green manure, vermicast and humanure, as well as wild animal droppings replace domesticated animal manure as a fertiliser where required.

COMMERCIAL PRODUCTION (DRY FLAT LAND) NE of container

Ideas include:

Shadehouse for plant production: Edibles: (bananas, passionfruit, cherimoya etc)

Medicinal plants

Plants for making natural dyes

Polytunnel or greenhouse

Locusts for protein (endemic to the area, could be used to feed koura)

Distilling (flowers, kanuka, manuka)

Cottage Industry (upcycling, furniture, plant based medicinal or cosmetic preparations)

Storage/support for aquaculture

Pine nuts (growing well in shelterbelt)

Broad beds for annuals either domestic or commercial (irrigated): Kumara, potatoes, corn, hemp, flowers

PRODUCTION AREA SW of container

More fertile land closer to water source for irrigation

Ideas include: Broad beds for annuals either domestic or commercial (irrigated): Kumara, potatoes, corn, hemp, flowers OR AQUACULTURE (see detail map) - Koura (native freshwater crayfish) or other suitable species (extension of Zone 3 Aquaculture)

ECOLOGICAL INTEGRATION:

Zone 5 (native bush) wraps around Zone 2 Foodforest on all sides, and many useful (edible, medicinal, nitrogen fixing, firewood) native plant species are integrated into the foodforest. Kiwis live throughout the area and regularly visit at night, as well as morepork, tui, fantail, yellowhammer, quail and pheasant. Invertebrates, insects, frogs and lizards are plentiful. Butterfly attractant and bee-forage species are planted throughout Zone 2 (mexican daisy, borage, marigold, wildflowers, bulbs, herbs). The mixed native bush shelterbelt adjoins the rest of Zone 2 incorporating flaxes (nectar) manuka and kanuka and other flowering natives (bees).

ZONE 2 (detail)
Aquaculture Option

ZONE 2

ZONE 5

ZONE 1

ZONE 2

Dry flat land
COMMERCIAL PRODUCTION
and/or
Annual crops
irrigated

Pine nuts

Pine nuts

ZONE 2

FOODFOREST
follows watercourse
and integrated into
Zone 1 & Zone 5 bush

Olives/shelter

solar/wind

CONTAINER
Studio/storage
powers system
covered workshop

Irrigation
line

AQUACULTURE

Koura/Eel
Native Plants surround
Blends into shelterbelt
Links to Zone 3
Aquaculture

DAM

Willow

DAM

Shelter Belt- Natives

ZONE 3



ZONE 3

POTENTIAL COMMERCIAL CROPS:

LIST A

Already growing well requiring minimal input beyond establishment

Bananas

Passionfruit

Mandarin

Lemon

Lime

Olives

Cherry guava

Peaches (local seedlings)

Cape gooseberries

Natives (kanuka & manuka for honey and essential oil)

LIST B

Established and starting to produce or showing promise

Pine Nuts

Cherimoya

Tropical guava

Babaco

coffee

grapes

Loquat

Pears

LIST C

Experimental, untested or variable results (currently)

Pepino

Tamarillo

choko

Apples

Nectarines

Plums

Raspberries

LIST D

Other established plants

Hibiscus

Rosemary

Lemon balm

LIST E

AQUACULTURE (see detail map)

Commercial scale

Koura

Watercress,

Waterchesnut

Taro

PRODUCTION SYSTEMS:

Swales and dams are in place first. Native shelterbelts planted. Nitrogen fixing trees such as tagasaste, honey locust, swamp wattle are interplanted with the cropping trees (to be determined). Bush crops are planted in rows, interplanted with mineral accumulators and green manure (lupins, comfrey etc) and chop and drop crops such as canna lily and whau. Rows are wide enough to allow 4- wheel drive access and tractor mowing for mulch and building soil (synergy).

In addition the nutrient rich water of the aquaculture dams can be used to fertilise the Zone 3 production areas along with wild bird droppings and green manure in the absence of domesticated livestock.

ECOLOGICAL INTEGRATION:





Zone 5 (native bush) joins Zone 3. Kiwis live throughout the area and regularly visit at night, as well as morepork, tui, fantail, yellowhammer, quail and pheasant.

Invertebrates, insects, frogs and lizards are plentiful. The mixed native bush shelterbelt adjoins the rest of Zone 3 incorporating flaxes (nectar) manuka and kanuka and other flowering natives (bee forage). Grassland creates habitat for locust and other invertebrates.

Additionally the dams create their own rich ecology, including dragonflies, frogs (tadpoles) and freshwater invertebrates providing habitat and food for koura, wild duck, pukeko, pheasant and quail.

ZONE 3A COMMERCIAL PRODUCTION

Fertile sheltered NW
facing slope
Tree crop (eg. nuts,
bananas citrus and
guilts) Interplanted on
swales

-  Tree crop
-  Kanuka
-  Understory
-  Bush crop

ZONE 3 (detail) Aquaculture Option

ZONE 3

ZONE 4

ZONE 5

ZONE 2

Foodforest extention,
subtropicals,
specialist crop

ZONE 3A

rock edge
swimming
hole

wildlife corridor

SLOPE/FLAT Boundary

HOUSE
SITE

Aquaculture

Aquaculture

Aquaculture

Aquaculture

ZONE 3B

Aquaculture

Aquaculture

Shelter Belt- Natives

Aquaculture

Aquaculture

Reticulated water line
(solar powered)



20m

ZONE 4

POTENTIAL COMMERCIAL CROPS:

SE Facing dry slope

FRUITS

Olives
Grapes
Loquat

NUTS

Pine Nuts
Chestnuts
Walnuts
Hazelnuts
Almonds
Pecan (bottom of slope)

HERBS (interplanted)

Rosemary
Perennial Medicinal crops
Dye plants

NATIVES

Kanuka & Manuka (honey and essential oil)
Flax (weaving & medicinal)

OTHER

Willow (bottom of slope)
Hickory
Oak

PRODUCTION SYSTEMS:

Swales and in place first. Native shelterbelts planted. Nitrogen fixing trees such as tagasaste, honey locust, swamp wattle are interplanted with the cropping trees (to be determined) underplanted with chop and drop crops such as whau, comfrey, or lupins.

Wild bird droppings and green manure add fertiliser in the absence of domesticated livestock.

Drought resistant grasses grow between the tree crop rows which are wide enough to allow 4-wheel drive access and tractor mowing for mulch and building soil (synergy).

Hay can also be collected and used in mushroom production.

ECOLOGICAL INTEGRATION:

Zone 5 (native bush) joins Zone 4. Kiwis live throughout the area and regularly visit at night, as well as morepork, tui, fantail, yellowhammer, quail and pheasant.

Invertebrates, insects, frogs and lizards are plentiful. The mixed native bush shelterbelt is also part of Zone 4 (NE) incorporating flaxes (nectar) manuka and kanuka and other flowering natives (bee forage) and blends into Zone 5. Grassland creates habitat for locust and other invertebrates.

Through the use of selected natives such as whau and cabbage trees Zone 4 visually blends into Zone 5 and provides additional wildlife habitat.

ZONE 5

NATIVE BUSH, WILDLIFE CORRIDOR

Uses: Medicinal natives, forage plants, wildlife habitat, mushrooms (under canopy), walking tracks, sustainable firewood, bee food.

