PERMACULTURE DESIGN

For a Courtyard

2/2/2016

UNDER THE CHOKO TREE
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Ethics and Goals

The following ethics and goals underpin the work that we do in and around the balcony garden.

Balcony Garden Ethics

1. We grow food using organic gardening principles
2. We grow what we eat and eat what we grow
3. We use recycled materials where possible

Our Goals

- Grow as much food as is practical

What is Permaculture?

“Permaculture is a design system for creating sustainable human environments. The word itself is a contraction of not only permanent agriculture but also of permanent culture as cultures cannot survive without a sustainable agricultural base and land use ethic”.

From “Introduction to Permaculture” by Bill Mollison with Remy Mia Slay

Permaculture is not just for large scale agricultural concerns, however and translates equally well from balcony through back yard and acre block to full scale agriculture equally well, the ethics and principles apply at all levels.

Permaculture Zones Explained -

Zone 0 – In urban Permaculture this is usually the house or dwelling.

Zone 1 – this is the vegetable garden which is intensively cultivated and is likely to need the most intervention in the form of watering, weeding and harvesting etc and so is placed closest to zone 0

Zone 2 – this zone contains the closely planted and somewhat intensive fruit orchard which is also close to zone 0 but requires less intervention than the veggie production area.

Zone 3 – is the farming zone where commercial crops are grown and animal forage systems are used such as organic orchard, nut forest or extensive organic poultry system, or even cereal production or sheep or goats could be raised here.

Zone 4 – is the harvest forest where long term tree species are grown to produce firewood, mulch or timber to be used for sustainable building, complementary grazing animals can also share this zone at low stocking rates.

Zone 5 – is the indigenous conservation zone where plants native to the region are allowed to regrow into what would become natural forest.

In reality, the courtyard garden will only be able to provide zone 1 with possibly some zone 2 elements although membership of a community garden or being given access to offsite land in the form of friends’ or relatives’ backyards could allow some zone 2 elements as well.

Courtyard Permaculture Assessment

The balcony was assessed on the 2nd of February 2016 by the author of this plan.

The courtyard is on the northern side of the townhouse and is partially covered with concrete paving. There is an L-shaped growing area of approximately 35m^2 which has 3 ornamental topiaries and a bed of various purple ornamental groundcover on the northern side and a paw paw tree in south eastern corner of the L. There is 740mm x 740mm drain in the north eastern corner of the yard, which cannot be covered over.

Surrounding the yard on the northern and eastern side is a colourbond fence approximately 1500 mm tall on the northern side and approximately 180mm tall on the eastern side. There is a fold-down clothes line attached to one of the northern walls of the house, and the doors out into the courtyard area are also on a north facing wall.

The courtyard is sheltered by the house from the south, which would attenuate any bad weather coming from that direction. The house is constructed of blond brick so some of the solar radiation falling on it would be reflected but there was enough thermal mass so that a warm microclimate would be formed by the house walls and concrete paving.

There are two accessible stormwater downpipes, one on the northern face of the house and one on the east face of the house which could potentially be used for watering the garden directly, topping up the wicking beds or being directed to water storage.

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The Permaculture Design

The area we have to work with is fairly small and will require removal of the existing plant material before implementation of the plan can commence. The design is broken up into a number of elements under the following headings –

1. Food

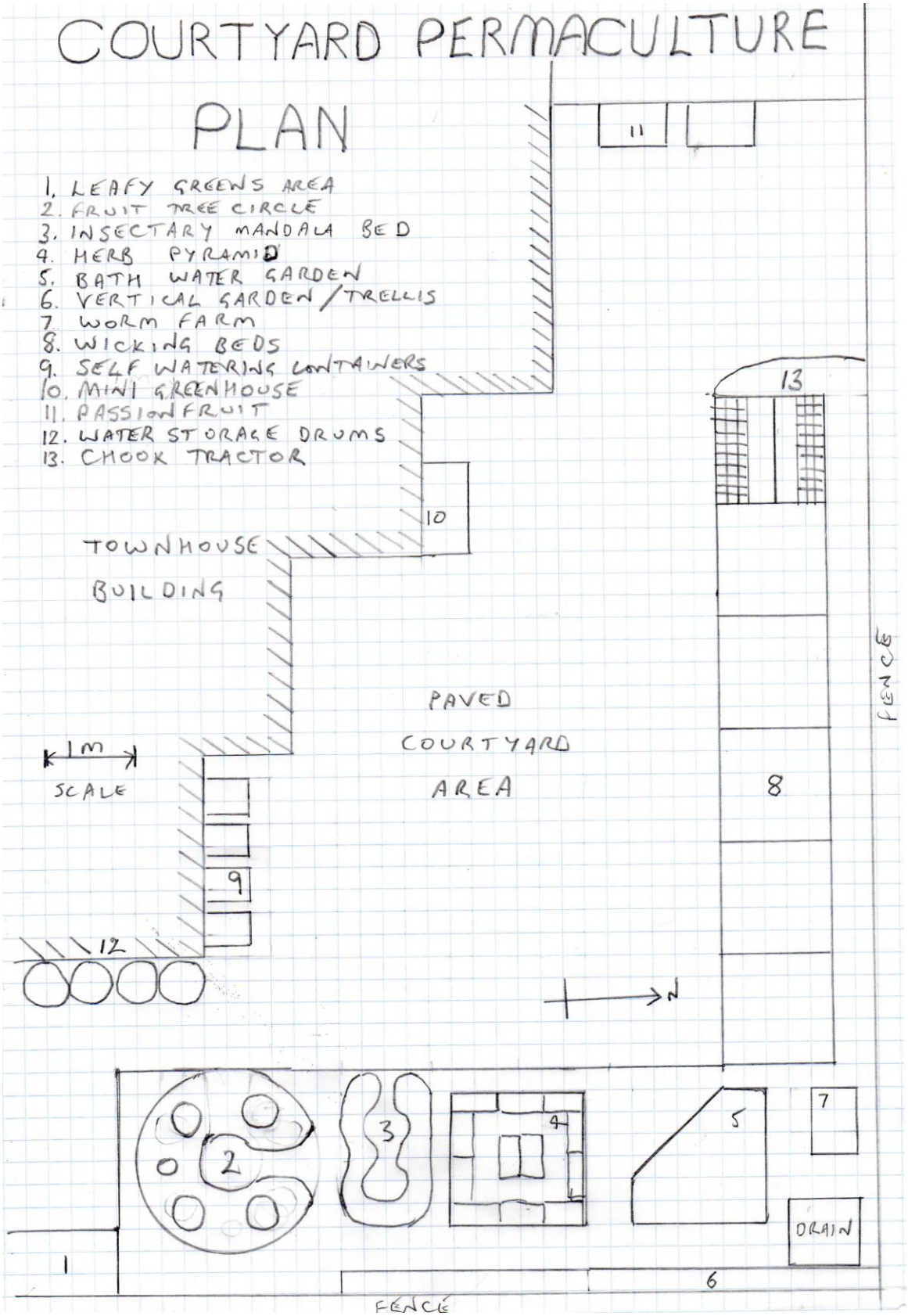
1.1 Leafy Greens area
1.2 Fruit tree circle
1.3 Insectary mandala bed
1.4 Herb Pyramid
1.5 Vertical Garden/ trellis
1.6 Wicking beds
1.7 Self-watering containers
1.8 Mini-greenhouse
1.9 Passionfruit area
1.10 Chook tractor
1.11 Sprouts
1.12 Microgreens

2. Water

2.1 Bath Water Garden
2.2 Water Storage drums

3. Waste

3.1 Worm Farm



Element 1 - Food

The first element in this permaculture design is the provision of food. This design uses a number different elements to produce food in a small area.

Sub-Element 1.1 – Leafy Greens Area

Description

This bed is on the eastern side of the house between the house and the fence, it is a narrow bed only 700mm wide to allow harvesting the entire bed form one side of the paved area.

Features

- Grows leafy cut and come again vegetables to provide extended harvest
- Allows shady are to be productive by growing leafy vegetables
- Shade prevents bitterness developing in leafy vegetables
- Excess produce can be fed to chooks

Plan details

1. Remove existing plants and bushes
2. Recondition soil with compost and manure
3. Water deeply
4. Mulch with organic mulch eg sugar cane mulch
5. Plant out with leafy green vegetables

Plant list

Lettice, spinach/silver beet, kale, bok choi, mizuna, mibuna, mitsuba, mustard greens, tatsoi, rocket, sorrel, chicory, coriander, Malabar spinach

Element 1.2 – Fruit Tree Circle

Description

Fruit trees are planted into a raised keyhole bed which allows access to the fruit trees, all trees are dwarf and the area is mulched with organic mulch. The access route faces north allowing the trees to form a sun trap, which could be used as a place to sit in winter.

Features

- Provides area for growing fruit.
- Shallow rooted crops, insectary plants or herbs can be planted under the trees
- Can provide structure to grow climbers up once established
- Provides sheltered sun-facing area for sitting

Plan details

1. Dig the area deeply and dig in manure and compost,

2. Mark a 2 metre circle using 2 stakes and a 1 metre length of twine
3. Excavate the centre of the circle to form a 0.5 metre depression surrounded by a keyhole bed with the entry to the keyhole facing the house.
4. Mulch the centre with woodchips
5. Plant fruit trees and mulch the area with woodchips
6. Plant any accessory plants and water deeply

Plant list

Trees: dwarf lemon, fig, mandarin, Nectarine and avocado
Accessory plants: rosemary, Alyssum, Bergamot, Borage, Calendula, Californian Poppy, Candytuft, Chicory, Coriander, Coreopsis, Cosmos (caudatus), Dill, Flax, Gerbera, Globe Gilia (blue thimble flower), Gypsophila (Baby's Breath), Hearts Ease (wild pansy), Lavender, Lupins, Marguerite Daisy, Marigold, Nasturtium, Phacelia, Queen Anne's lace, Shasta Daisy, White Clover, Yarrow, Zinnia

Element 1.3 – Insectary Mandala Bed

Description

This bed is built in an irregular keyhole form (sort-of mandala) to provide easy access to all areas of the bed for sowing and planting, weeding, inspection and harvest. It can also be used as a place to sit amongst the flowers. This bed is designed to provide flowers which will attract pollinators and predators which will in turn ensure that flowering crops are pollinated and pests are kept in check but the plants used may have other uses such as cut flowers, have edible flowers or other parts or be useful in some other way as well as their primary insectary role.

Features

- Provides area for growing flowers
- Predators and pollinators are attracted to the garden
- Cut flowers cat grow in the bed
- Herbs can grow in the bed
- Nitrogen fixers improve fertility of the bed

Plan details

1. Lay out the outline with a hose or rope
2. Dig out the centre and use the spoil to build up the bed
3. Add extra organic material/compost if required
4. Mulch the bed with sugarcane mulch or other organic material
5. Place wood chip mulch in the centre walkway area
6. Water bed and plant seeds/seedlings

Plant list

Alyssum, Bergamot, Birdsfoot trefoil, Borage, Buckwheat, Calendula, Californian Poppy, Candytuft, Chicory, Coriander, Coreopsis, Cosmos (caudatus), Dill, Flax, Gerbera, Globe Gilia (blue thimble

flower), Gypsophila (Baby's Breath), Hearts Ease (wild pansy), Lavender, Lucerne, Lupins, Marguerite Daisy, Marigold, Mustard, Nasturtium, Phacelia, Queen Anne's lace, Shasta Daisy, White Clover, Yarrow, Zinnia

Element 1.4 – Herb Pyramid

Description

This is based on the idea of a herb spiral but uses full size besser blocks, both the form the sides but also to act as planters for herbs within the spaces in the blocks. The blocks are already on site and so do not need to be sourced from outside but will be reused.

Features

- Herb growing area
- Provides microclimate for various herbs depending on their position in the pyramid
- Allows extra growing area by use of vertical space

Plan details

1. Remove clean and stack the blocks, then pain inside and out with a water-based latex paint and allow them to dry prior to construction time
2. Set out the outer, bottom course, then set out the inner two courses ensuring a firm base.
3. Fill the blocks and area between the courses with soil and compost
4. Mulch all soil surfaces
5. Plant with herbs, ensuring a rosemary bush goes at the top.

Plant list

Basil, garlic, rosemary, oregano, mint, lemongrass, garlic chives, dill, fennel, parsley, nasturtium, sage tarragon, thyme.

Element 1.5 – Vertical Garden/Trellis

Description

Allowing the option of growing suitable plants upwards, a trellis is a wire frame attached to the fence, a vertical garden provides a way of growing normal plants vertically by providing a series of growing spaces vertically against the fence.

Features

- Increase growing area by using vertical space
- Reduces reflected heat and light by covering steel fence, keeps the area cooler
- Improves the look of a colourbond fence
- Improves yield by getting fruiting crops off the ground and allowing airflow through the plants

Plan details

For a trellis – obtain timber and build a framework the seam height as the fence, tack wire over the framework and attach the trellis to the fence with galvanised screws or bolts.

For a vertical garden – obtain pallets, stand the pallets vertically and insert timbers to form shelves, fill the shelves with growing medium and plant out.

Plant list

For a trellis – pumpkin, squash, cucumber, runner beans, climbing peas, Malabar spinach, rockmelon

For vertical garden – salad leaf vegetables and/or herbs

Nil

Element 1.6 – Wicking Beds

Description

Made from two 1.2m x 1,2m AQC treated veggie beds, stack one on top of another these grow beds will be where the majority of the vegetable production is carried out. The top section contains growing medium whereas the lower section is a water reservoir so that they are very water efficient. The chicken tractor is designed to sit over the top of the wicking beds one at a time to cultivate and fertilise each bed in turn.

Features

- Allows vegetables to be grown seasonally, staggered to allow continual harvest
- Very water efficient
- Provides food for chickens

Construction Details

1. Obtain 12 1.2 x 1.2 veggie beds, black builders plastic film, a roll of 50mm ag pipe, sufficient gravel or wood chips to fill half the beds (about 2.5 – 3.0 cubic metres) and an equal amount of growing medium, plus organic mulch.
2. Assemble 6 of the veggie beds according to the instructions, place a layer of plastic inside to form a reservoir and a length of ag pipe, long enough to be secured to the side when the full bed is assembled into each bed.
3. Fill the bed with gravel or wood chips
4. Assemble the top beds and place in position, secure with wood and screws.
5. Fill the top bed with growing medium and mulch, then plant out
6. Fill the wicking beds with water until it leaks from between the beds.

Plant list

Kale, broccoli, carrots, potatoes, broad beans. Beans, onions, baby spinach, full size spinach, zucchini, leeks, tomatoes, capsicum,

Element 1.7 – Self-Watering Containers

Description

The containers are composed of black plastic to provide UV protection and are constructed similarly to a wicking bed in that they have a water reservoir underneath the growing medium and a pot full of growing medium which dips down into the water reservoir to keep the growing medium moist. This type of container is very water efficient and ideal for many crops including rhizome crops. They are sited against the wall to make use of the warm microclimate next to the bricks for winter growing.

Features

- Water efficient pots
- Make the most use of available sun and heat
- Keeps the area cooler by absorbing heat
- Ideal for tropical crops

Plan details

1. Obtain containers (must be black and shock resistant) from Masters, some 100mm plastic pipe, some 25mm plastic tube and a plastic pot as deep as half the depth of the container.
2. Cut out the inner part of the lid from the rim with a jig saw
3. Drill 6mm drainage holes in the lid and cut a hole in the centre slightly smaller than the plastic pot
4. Drill a 25mm hole for the filler tube in one corner of the lid cut out
5. Cut 4 lengths of pipe the same as half the depth of the container
6. Assemble by placing the pipe sections upright in the container, insert the pot in the hole and place the lid cut out on top of the pipe sections, insert the filler tube in the hole.
7. Drill a 6mm overflow hole in each side of the container slightly below the level of the lid cut out.
8. Fill with growing medium, plant out and fill with water.

Plant list

Ginger, turmeric, galangal

Element 1.8 – Mini-greenhouse

Description

This is a steel tube and plastic connector structure covered by a clear plastic envelope, it is used to raise seedlings and is currently in place.

Features

- Provides area for raising seedlings which will be grown on in the other containers
- Provides an area for growing microgreens

Plan details

No construction requirements, structure is already in place, but may require the design and construction of a shadecloth cover for summer seed raising requirements.

Plant list

Any and all except potatoes and any root crops

Element 1.9 – Passionfruit Area

Description

Self-watering containers in this area allow the production of fruit by growing passionfruit up the western fence. A trellis is provided to allow production from the vertical space. Passionfruit plant will take a couple of years to fill the space so in the meantime catch crops like Malabar spinach or cucumber can make use of the vertical space. Also, interplanting with peas or beans (depending on the time of year) can boost yields from the area and provide nitrogen for the passionfruit

Features

- Provides space for training vertical fruit & vegetables
- Reduces heat reaching the eastern side of the fence, keeping the area cooler on summer mornings

Plan details

1. Make 2 self-watering containers as per element 1.7
2. Fill with growing medium and mulch
3. Construct and secure trellis as per element 1.5
4. Plant out each container with one passionfruit vine and any ancillary plants

Plant list

Main planting: Passionfruit vine
Ancillary Plants: climbing beans or peas, cucumber, Malabar spinach

Element 1.10 – Chook tractor

Description

The chook “tractor” is an open bottomed portable chook shed with the same footprint as the wicking beds. The chook tractor will support two chickens, which will spend a month on each wicking bed with the result that they will spend two months on each bed during the year. The tractor has wire around the bottom on three sides with the side facing north being covered in to provide shade. The top part provides a roost, laying area and fittings for a feeder and waterer.

Features

- Provide eggs and companionship from the chickens

- The chickens turn over the beds and provide manure to help maintain fertility
- Provides a focal point for the garden.

Plan details

1. Construct framework on a base of 1200mm x 1200mm, put up an A-frame on the base extending to 1200mm high.
2. Insert roosts and nesting areas 600mm up the A-frame.
3. Cover the top 600mm with plywood (external grade) and extend the plywood down one side of the A-frame section, this is to be faced north to provide shade in summer.
4. Hinge the short side of plywood on the A-frame to provide access for feeding and watering the chickens and removing the eggs.
5. Cover the bottom half of the A-frame with 1cm square wire mesh
6. Install carrying handles on four sides and paint the whole tractor white.

Plant list

Chooks x 2

Element 1.11 – Sprouts

Description

Sprouts can be grown using a number of techniques that do not require direct sunlight, soil or much water or growing space.

Features

- Provide fresh vegetables without taking up growing room in the courtyard

Plan details

1. Obtain one (or several) glass jars and filter material such as pantyhose and a thick rubber band per jar.
2. Place a dessert spoon of required seed into the jar, cover the top of the jar with panty hose or similar material and secure with rubber band.
3. Half fill the jar with water leave overnight
4. Empty the jar the next morning, rinse and leave the jar on it side to drain
5. Repeat morning and night for 5 – 7 days
6. Remove grown sprouts form the sprouter, they are ready for use and can be kept in the refrigerator for up to a week.

Plant list

alfalfa, clover, fenugreek, lentil, pea, chickpea, mung bean, oat, wheat, maize (corn), rice, barley, rye, broccoli, cabbage, watercress, mustard, mizuna, radish, and daikon, rocket, tatsoi, turnip, onion, leek, spinach, lettuce.

Element 1.12 – Microgreens

Description

Microgreens are plants which are grown in the mini-greenhouse and are harvested at an immature stage and can be included in salads, they do not require much space but do need light and soil.

Features

- Provide fresh vegetables taking up only a small amount of growing room in the courtyard

Plan details

1. Obtain a 290mm x 350mm seedling tray, fill with growing medium and compress.
2. Wash seeds and soak from 4 to 8 hrs before sowing
3. Sow thickly with desired seed or mixture of seed, compress again to ensure good soil/seed contact and cover with a thin layer of growing medium or newspaper, cloth etc
4. Water thoroughly or place on a capillary bed
5. Water regularly until seed is germinated and remove cover if used
6. Harvest with scissors in 10 -14 days at at least 4 leaf stage.

Plant list

alfalfa, clover, fenugreek, lentil, pea, chickpea, mung bean, oat, wheat, maize (corn), rice, barley, rye, broccoli, cabbage, watercress, mustard, mizuna, radish, and daikon, rocket, tatsoi, turnip, onion, leek, spinach, lettuce.

Element 2 – Water

There are a number of water sources around the courtyard area with the main one being a tap and hose on the northern wall. There is also a downpipe on the northern wall and the eastern wall of the house which could be tapped into to provide rainwater access.

Element 2.1 – Water Garden

Description

The water garden consists of a spa bath or regular bath set up in the north eastern corner of the courtyard area. It will be filled with water and contain goldfish to control mosquito larvae.

Features

- Provide a space to grow water vegetables such as water chestnuts, arrow leaf or kang kong
- The water helps reduce temperature swings and increases humidity in the area
- Water plants such as azolla can be grown on the water surface, they grow quite quickly and can be regularly harvested to provide a high nitrogen mulch for container plants
- The goldfish manure provides nutrients in the water which not only support the water plants but can be used to fertilise container grown vegetables by regularly withdrawing 30% of the water then refilling the pond with fresh
- A fishpond is a fascinating hobby and this is a low maintenance way to do it.

Plan details

1. Construct a timber or brick frame to support the bath and make sure any drain holes are plugged.
2. Place a layer of gravel 25-50mm thick on the bottom of the bath.
3. Fill with water.
4. Place pots filled with potting mix containing the plants to be grown into the water and add a layer of gravel to the top of the pots.
5. Add goldfish by floating the plastic bag they came in on top of the water for 30 minutes, then pouring them into the tub.
6. Place azolla on top of the water surface

Plant list

Water chestnuts, arrow leaf, kang kong, lotus, azolla.

Element 2.2 – Water Storage Drums

Description

There will be 5 blue plastic drums set up on the eastern wall of the house which will take water from the downpipe and allow storage of up to 1000 litres of useable rainwater. The drums will have an

overflow which goes from the closest drum to the downpipe to the next and so on so that all drums are connected. Eventual outflow from the furthest drum will be directed back to the stormwater system. The drums will also be provided with an outlet and tap which can have a hose attached to it to allow watering of beds by gravity feed.

Features

- The water helps reduce temperature swings and increases humidity in the area
- Using rainwater to water the vegetables and trees reduces reliance on reticulated town water thereby improving sustainability and reducing costs.
- Provides a back-up water supply in the event of an interruption to towns water supply

Plan details

1. Obtain 5 blue plastic (or equivalent) 200 litre second hand drums ensuring that then have not been used to contain anything toxic
2. Install a base using timber and bricks for the drums to stand on, it should be able to withstand 200kg weight for each drum when full.
3. Drill and install 12mm hose nozzles in the bottom of each drum to allow rainwater to be taken off for watering purposes when the drums a filled.
4. Install a pipe from the top of the last drum back to the downpipe to allow the rainwater overflow to be channelled back to the stormwater system.
5. Drill holes in the drums neat the top, install nozzles and hoses (25mm diameter at least) to allow overflows though each drum.
6. Install a take-off from the downpipe to channel water out of the stormwater system into the first drum,

Element 3 – Waste

Putrescible waste like veggie scraps can be turned into valuable fertiliser for use in the garden. Not only does this mean that a resource is recovered, it prevents material going to land fill which, if not properly treated will evolve methane gas during its decomposition. Methane is a much more potent greenhouse gas than carbon dioxide.

Element 3.1 – Worm Farm

Description

The worm farm can be either a commercial one or made from two polystyrene boxes. It will be installed in the shade which will keep the worm farm cooler.

Features

- Prevents putrescible waste going to landfill
- Provides material which can be used to increase fertility in the soil
- Provides material which can be used to make seed raising mixture
- Can provide worms to feed fish

Plan Details

1. Obtain rectangular commercial worm farm
2. Set up in accordance with manufacturer's instructions
3. Place in an easily accessible shaded area, as close to the back door as practical.

References

The Permaculture Home Garden – Linda Woodrow – Viking/Penguin Books(AUS) 1996

Earth Users Guide to Permaculture – Rosemary Morrow – Kangaroo Press (AUS) 2006

Introduction to Permaculture – Bill Mollison with Reny Mia Slay – Tagari Publications (AUS) 1991

The Edible Balcony – Indira Naidoo – Penguin (AUS) 2011

The Edible Balcony – Alex Mitchell – Kyle Cathie Ltd (UK) 2011

Permaculture in Pots – Juliet Kemp – Permanent Publications (UK) 2012

Appendix 1 – planting calendar

Month	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug
Beans - Climbing/dwarf												
Broccoli												
Cabbage												
Carrots												
cucumber												
Kale												
Lettuce												
Peas												
Snowpeas												
Potato												
silver beet												
Tomato												
zucchini												