CHAPTER 7

Strategies

CHAPTER 7: Strategies

7.1 Introduction

It is important to understand the whole story and not only a chapter of the story. The different design strategies were investigated and technically resolved for the entire site - not only the sketch plan area.

The storyline would've been unclear and not thoroughly understandable if only the sketch plan area was investigated in terms of the three main strategies, namely water, waste and agriculture.

7.2 Waste Strategy

The processes and activities that make up the waste strategy can be seen as the recycling of organic waste, which includes the recycling of green waste and vermicomposting, recycling of hard waste and the workshops where recycled waste is used.

7.2.1 Diagrams

Different diagrams are used to explain the processes required for the waste strategy. Figures 144 and 145 indicate all of these processes. Fig. 146 illustrates the circulation of vehicles and pedestrians dropping of waste at the waste management area. The recycling process of hard waste is explained in Fig. 147; where the waste comes from (input) and where the waste is sent to (output). Fig. 148 explains the organic waste recycling process; the waste comes from the agriculture area (vegetable off-cuts) and is sent to the vermicomposting facility.

Lastly, the garden waste process is explained in Fig. 149 where the garden waste delivered to the site is sorted, large branches are chipped (input) and thrown onto heaps. These heaps are then subjected to the Windrow system (described in Chapter 2, section 2.2.3.1.1). The compost produced during this process is then used for the agriculture activities and sold on site (output).

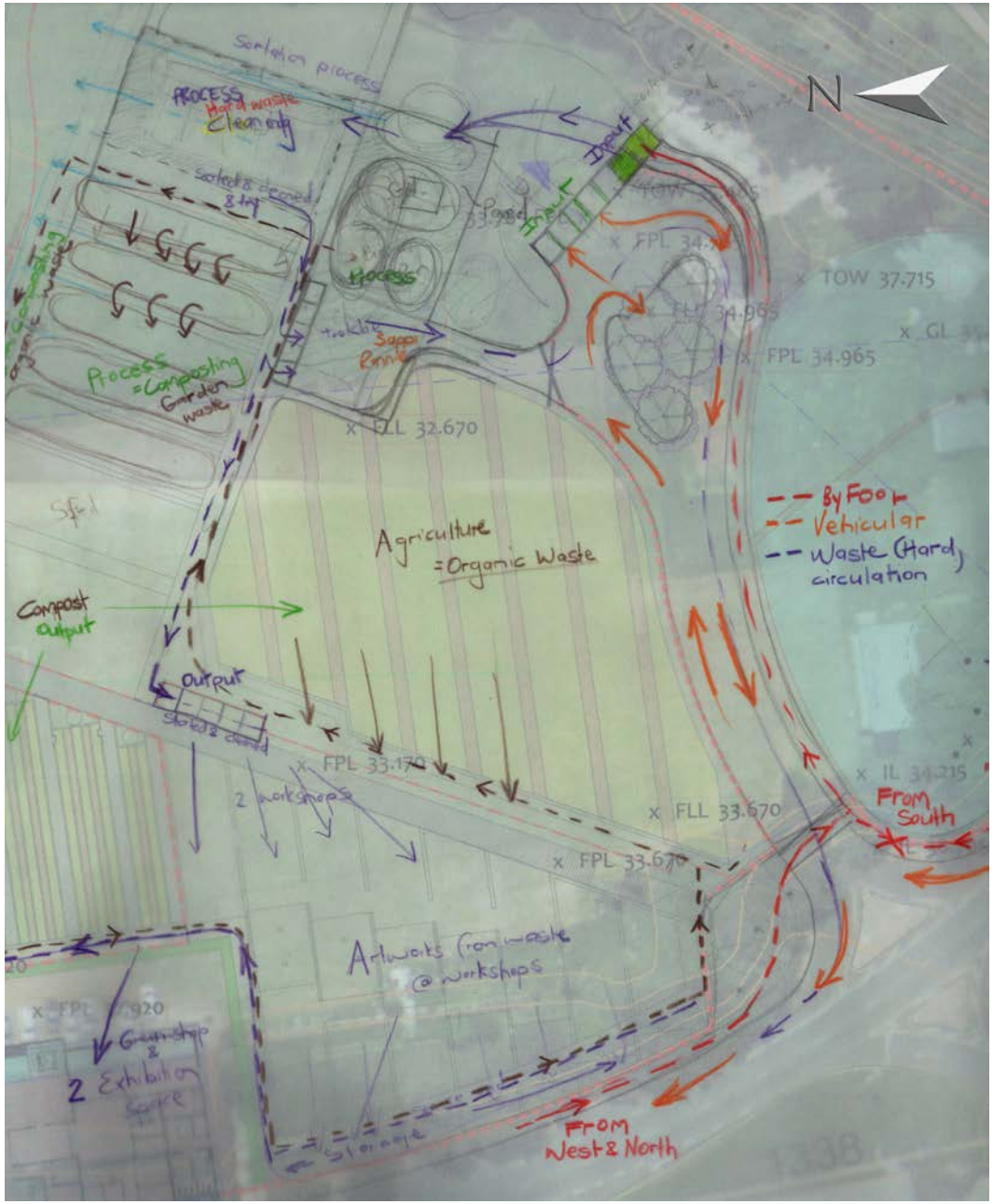

Fig. 144: Diagram of Waste Strategy (Author, 2012)

Fig. 145: Diagram of all the processes contributing to the Waste Strategy (Author, 2012)

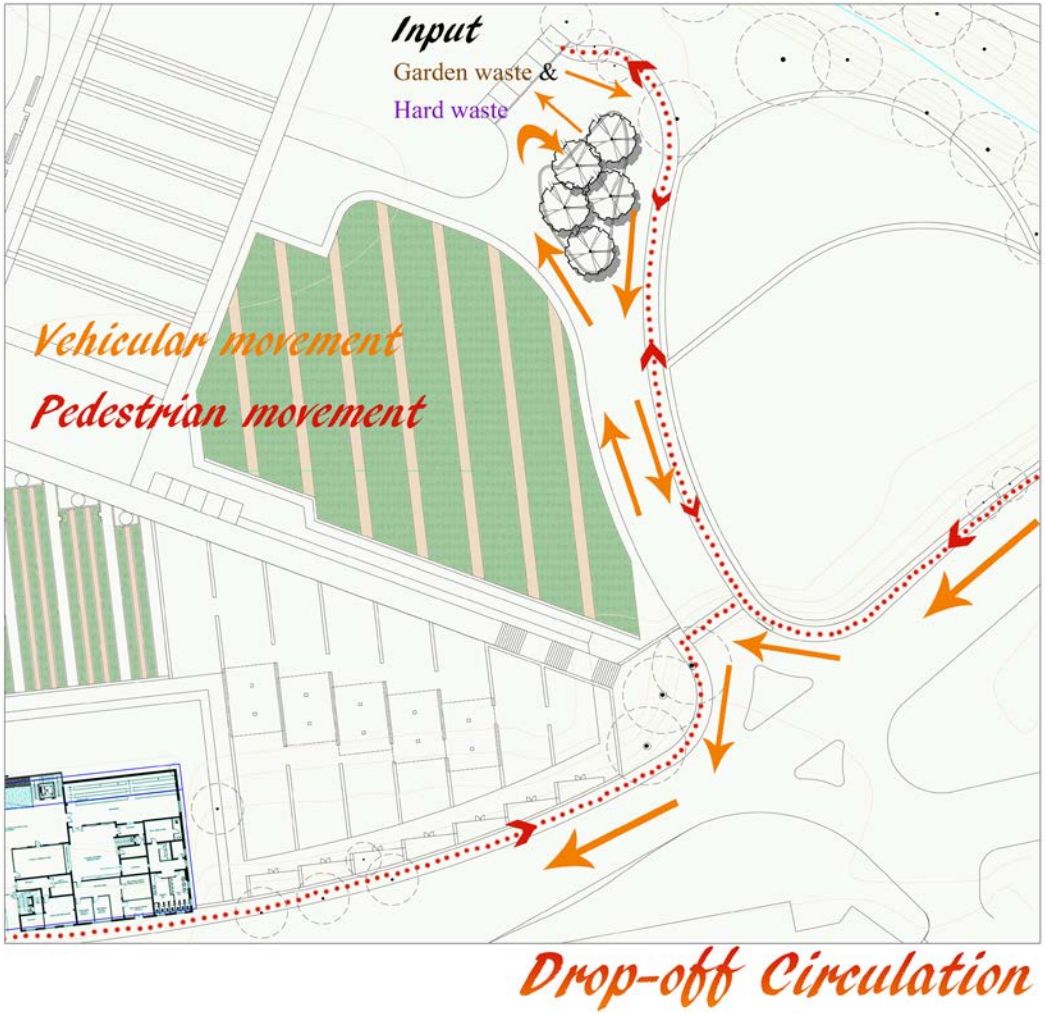

Fig. 146: Diagram of drop-off circulation (Author, 2012)

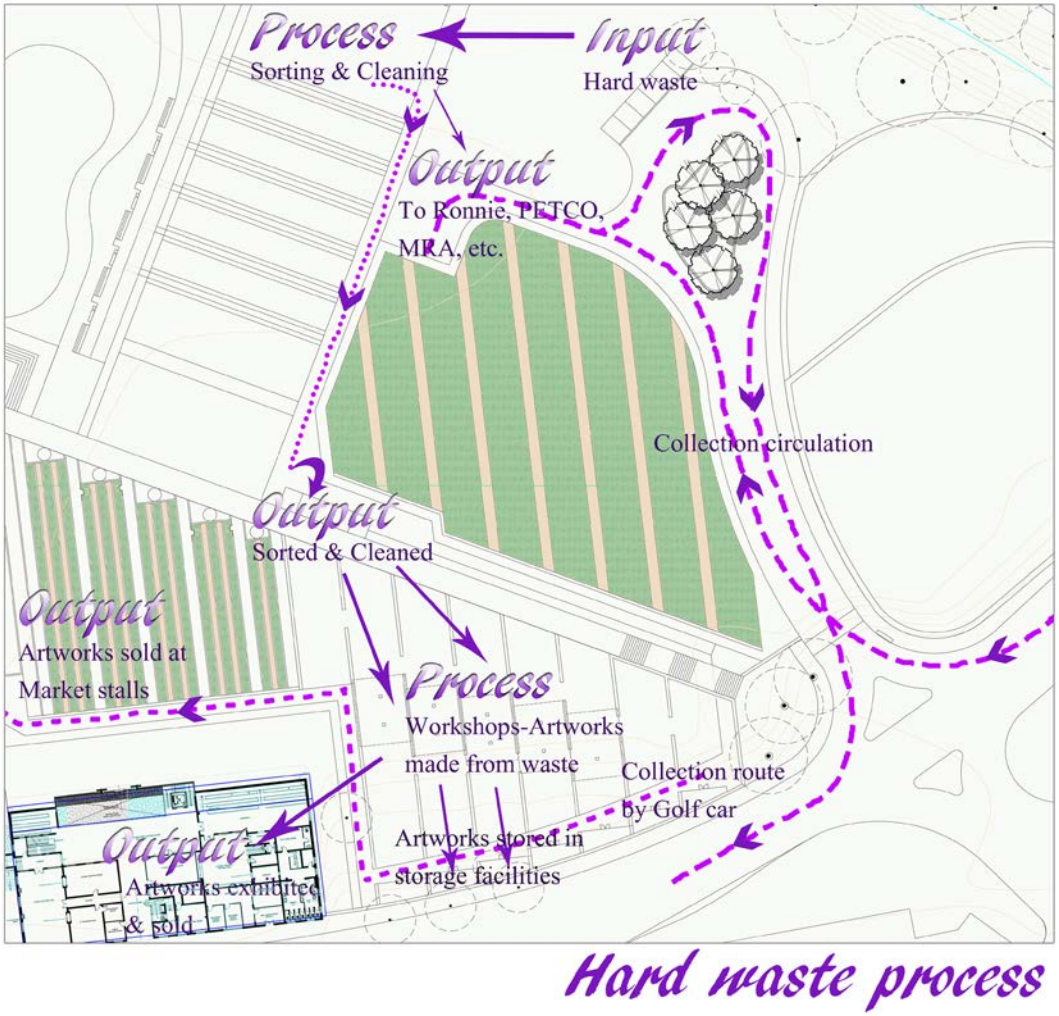

Fig. 147: Diagram of the Hard waste process (Author, 2012)

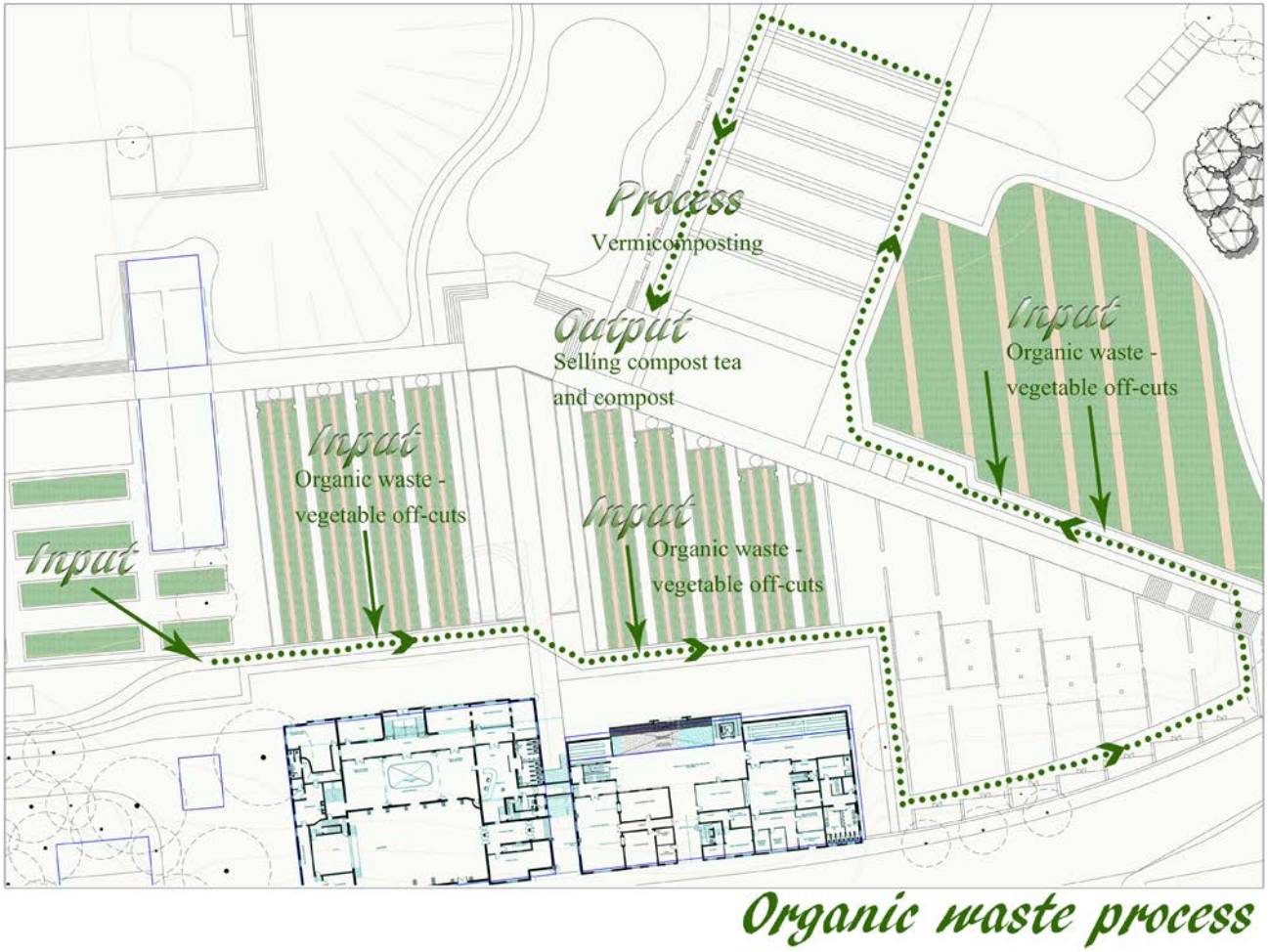

Fig. 148: Diagram of the Organic waste process (Author, 2012)

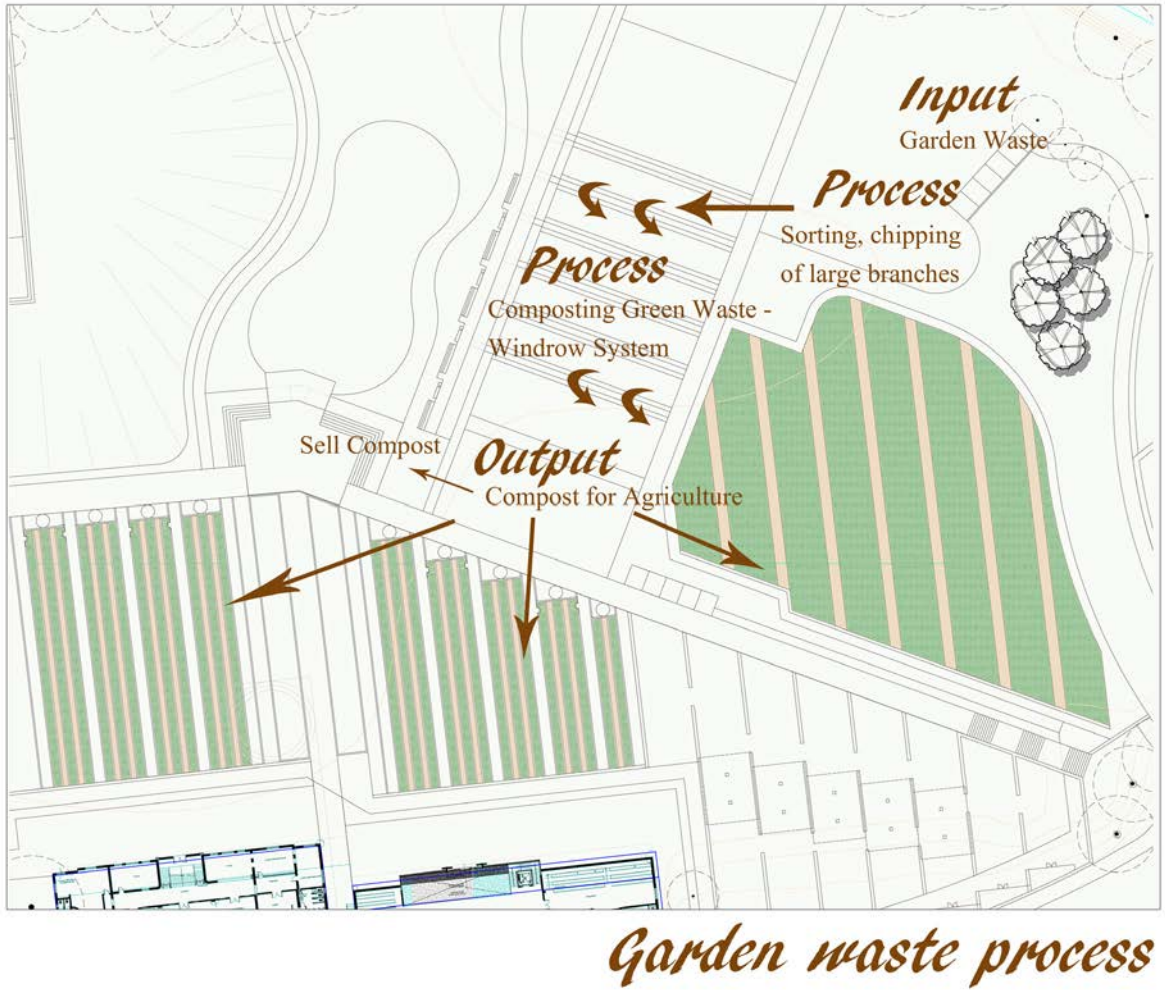

Fig. 149: Diagram of the Garden waste process (Author, 2012)

7.3 Agriculture Strategy

The agriculture strategy is all about the production of vegetables, vermicomposting the wasted vegetables and teaching visitors about vegetables and how to grow their own at home. Locals will also have the opportunity to hire a piece of land to grow their own vegetables (Refer to Figs. 150 and 151).

Fig. 150: Locals working in their own patch of land (Author, 2012)

Fig. 151: Locals working in their own patch of land (Author, 2012)

Golf carts will be used for collections and deliveries (Refer to Figs. 152 - 154).

Fig. 152 - 154: Golf cart for collections and deliveries (GCA, 2012)

Fig. 155: Diagram of all the processes contributing to the Agriculture Strategy (Author, 2012)

7.3.1 Diagrams

Fig. 155 explains the complete process of the agriculture strategy. Similar to the waste strategy, different diagrams are used to explain each process associated with the agriculture strategy separately. Fig. 156 illustrates the requirements for producing vegetables and the collection of vegetables.

The final destination of the vegetables produced on site is indicated on the delivery of vegetables diagram (Refer to Fig. 157). The vegetables are transported to the restaurant and sold at the market area. Fig. 158 illustrates that the leftover vegetables and the off-cuts are collected and transported to the vermicomposting facility to form compost and compost tea.

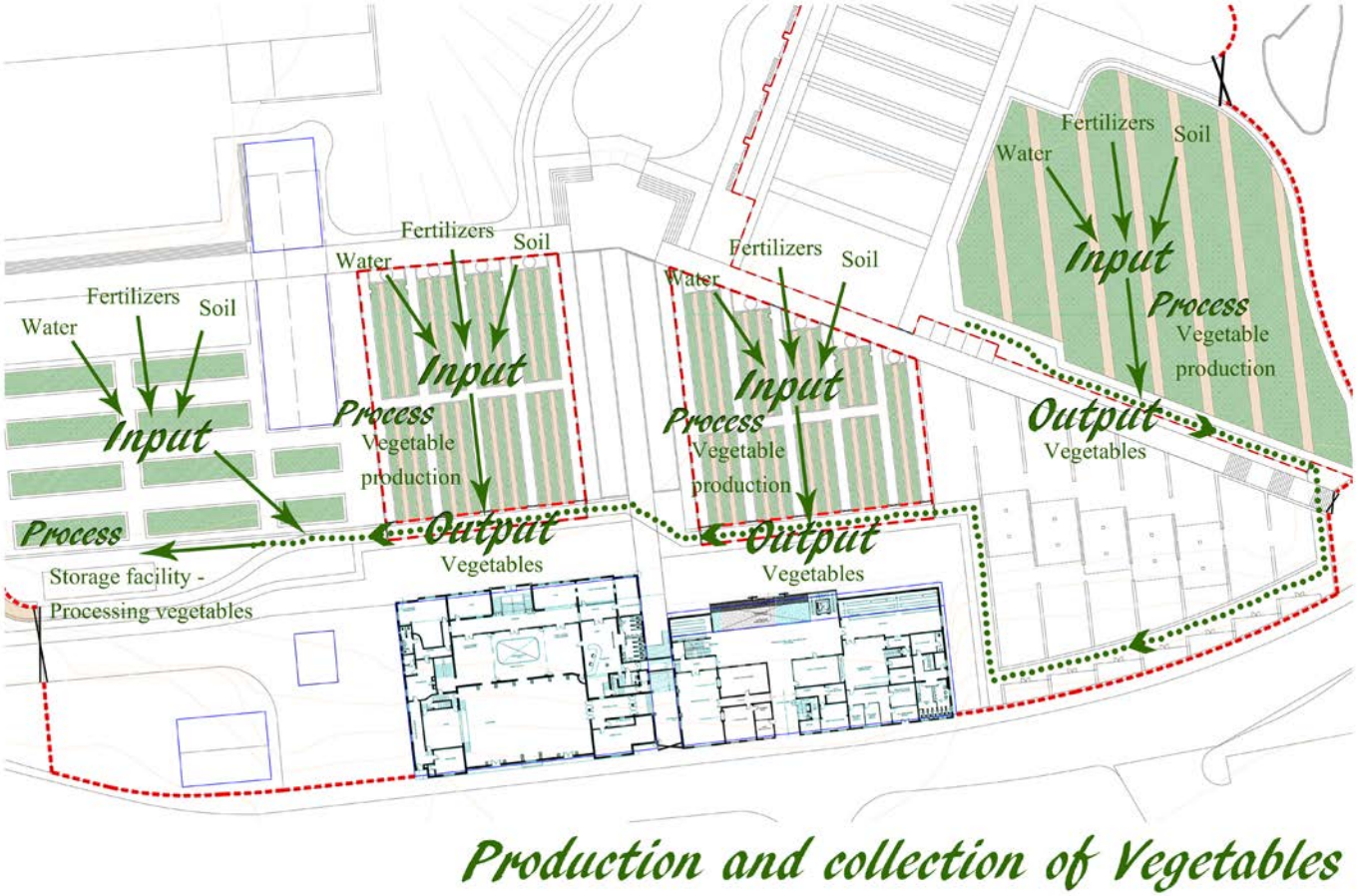

Fig. 156: Diagram of the production and collection of vegetables (Author, 2012)

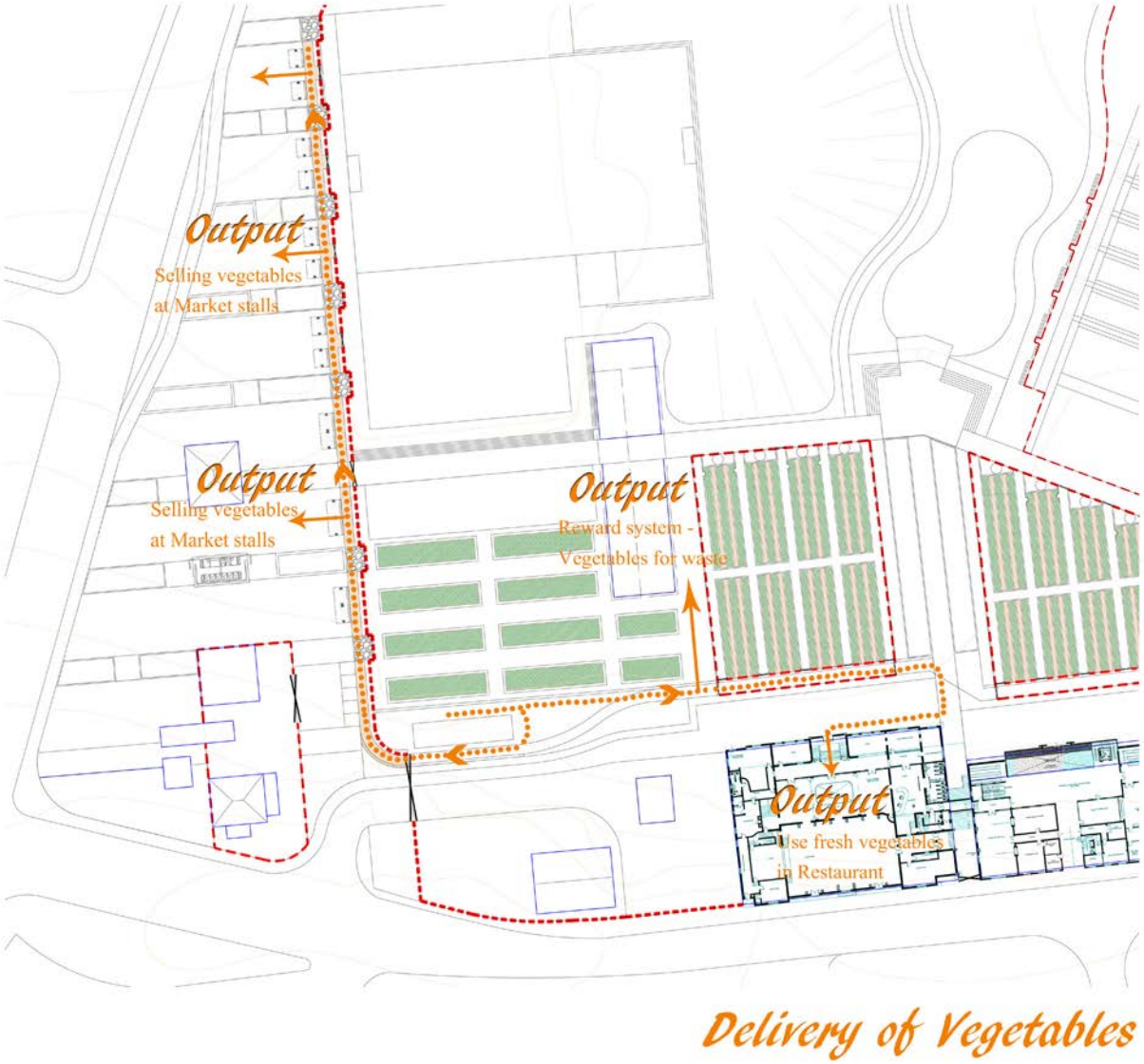

Fig. 157: Diagram of the delivery of vegetables (Author, 2012)

Fig. 158: Diagram of the collection of wasted vegetables (Author, 2012)

7.3.2 Vegetable information

The following guidelines are provided by the Department of Agriculture, Forestry and Fisheries (NDA, 2010) for the production of different vegetables (Refer to Fig. 159):

1. Pigeon peas grow well in temperatures between 18 and 29 °C. The plants are sensitive to waterlogging and frost.
2. Cabbage grows and develops in temperatures from 18 to 20 °C. Cabbage should be irrigated immediately after sowing or transplanting. Thereafter, irrigation should be applied at intervals of 10 to 12 days in heavy soils or 8 days in light soils and this schedule should be followed until the heads are fully developed and firm.
3. Squash are warm climate crops requiring a temperature range of 18 to 27 °C. It favours an average rainfall, but the roots are sensitive to high soil-water levels.
4. Sweet corn requires a warm to hot, frost-free growing season. The required soil temperature is between 20 and 35 °C. Well-drained, loamy soil is most suitable for sweet corn.
5. Green beans need to be irrigated regularly when growing in light, sandy soils and even on heavier soils. Adequate irrigation during flowering and pod development is needed for optimal yields.
6. Spinach requires a constant and uniform supply of water to obtain a good crop of high quality. Spinach fields are sprinkler irrigated to ensure the germination of seed.
7. Carrots are cool weather crops and also do well in warm climates. The optimum temperature for growth is between 15 and 20 °C. Carrots require approximately 25 – 50 mm of water per week.
8. Tomatoes need to be irrigated regularly during production. Excess irrigation after a long dry spell without prior light irrigation results in fruit cracking.
9. Pumpkins are warm weather crops and can be damaged easily by light frosts. A temperature range of 18 to 27°C is required for growth. Pumpkins prefer a generous water supply.

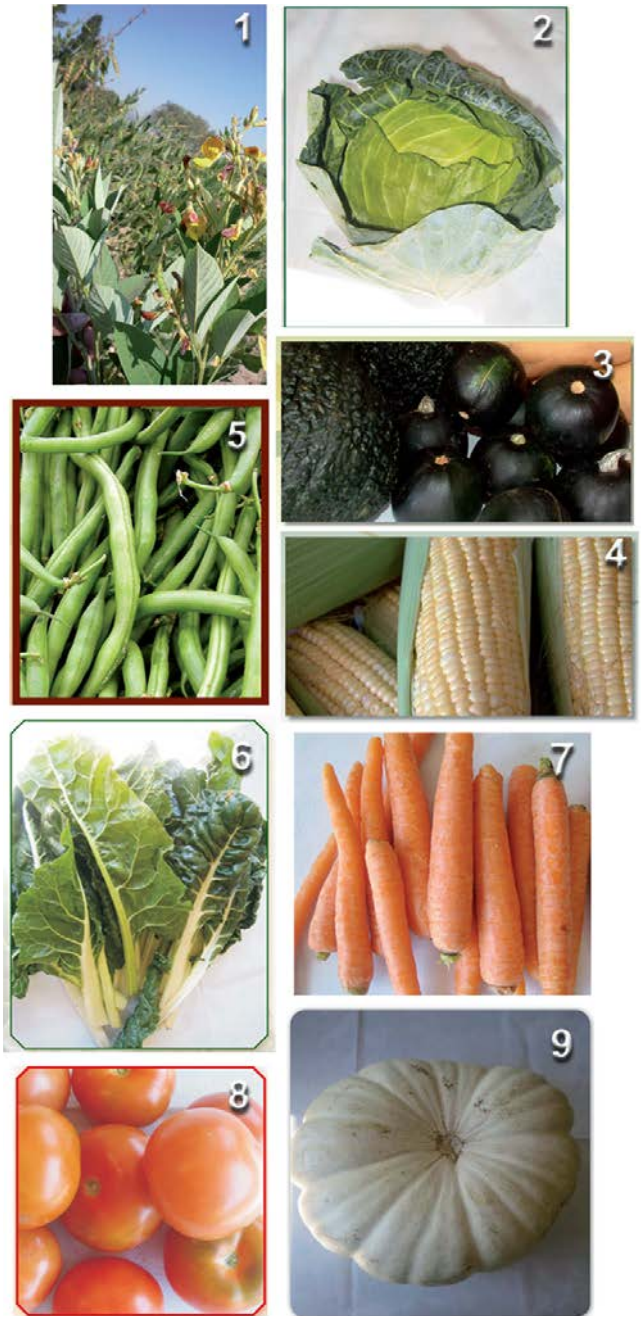

Fig. 159: Vegetables (NDA, 2010)

7.3.3 Calculations

The recommended vegetable consumption per person per day was calculated (Refer to Table 7). The amount of vegetables that could be produced per square metre was also calculated (Refer to Table 8).

The recommended vegetable consumption per person is at least 400 g per dav
[According to the World Health Organisation (WHO)]

	Vegetables (kg)	Period
One Person	0.4	per day
Recommended	146	per year
Recommended + Income	292	per year
Family of 6	1752	per year

	Vegetables (kg)	Area (m^2)
Average harvest per m^2	2.69	1
Average area needed per kg	1	0.372
For Family of 6	1752	651.60

Table 7: The recommended vegetable consumption per person (Maunder and Meaker 2009, modifications by the Author, 2012)

Information of Vegetables Grown

	VEGETABLE NAME	HARVEST: kg/m^2
1-	Pigeon Peas	0.4
2-	Cabbage	8.6
3-	Squash	1.1
4-	Sweet Corn	0.86
5-	Green Beans	0.6
6-	Spinach	0.75
7-	Tomatoes	6.2
8-	Carrots	3
	TOTAL:	21.51
	AVERAGE:	2.69

Table 8: Amount of vegetables produced per square metre (DAR 2006, modifications by the Author, 2012)

7.4 Water Strategy

The water strategy revolves around the collection (capturing), distribution and recycling of water throughout the site (Refer to Fig. 160).

Phase 1 is the construction of the storage dam and the restoration of the buildings on site. When the dam is completed rainwater is to be captured from catchment 1 (off-site water sources) while phase 2 (the rest of the Waste Park) is being constructed. When Phase 2 is completed and the park starts to function, there will already be water in the storage dam to kick-start the water harvesting process.

7.4.1 Diagrams

The distribution of water is illustrated in Fig. 161. One big storage dam will provide water to the entire site. There are five catchment areas, catchment 1 being the primary supply of the storage dam's water. Water is distributed from the storage dam to the agriculture, demonstration gardens, composting facility, waste cleaning facility and the recreational area. The collection of water is illustrated in Fig. 162 where catchments 2 to 5 will capture the runoff (remaining water after rain and usage), collect it in a wetland and pump the water back to the storage dam.

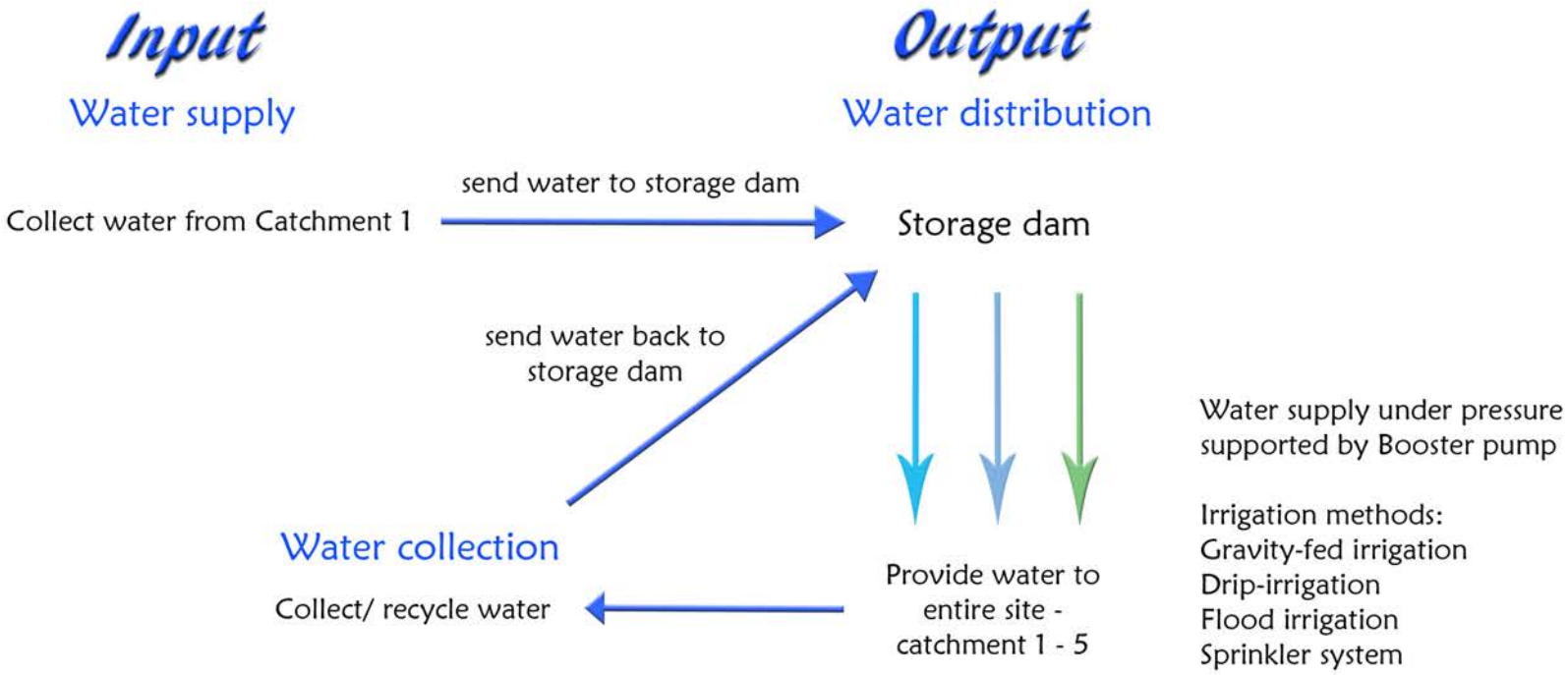

Fig. 160: Water Strategy summary (Author, 2013)

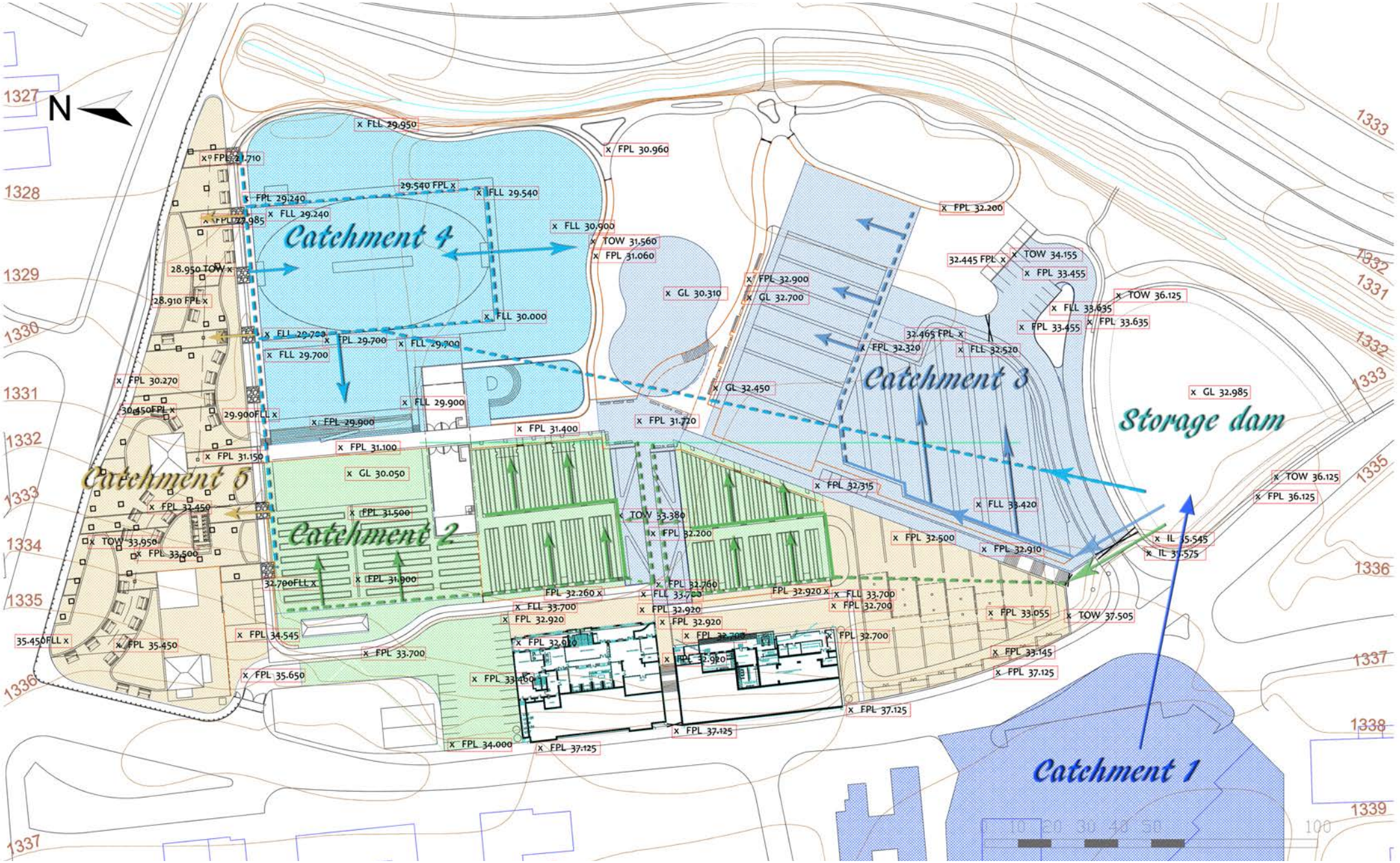

Fig. 161: Diagram of the water distribution of the Water Strategy (Author, 2013)

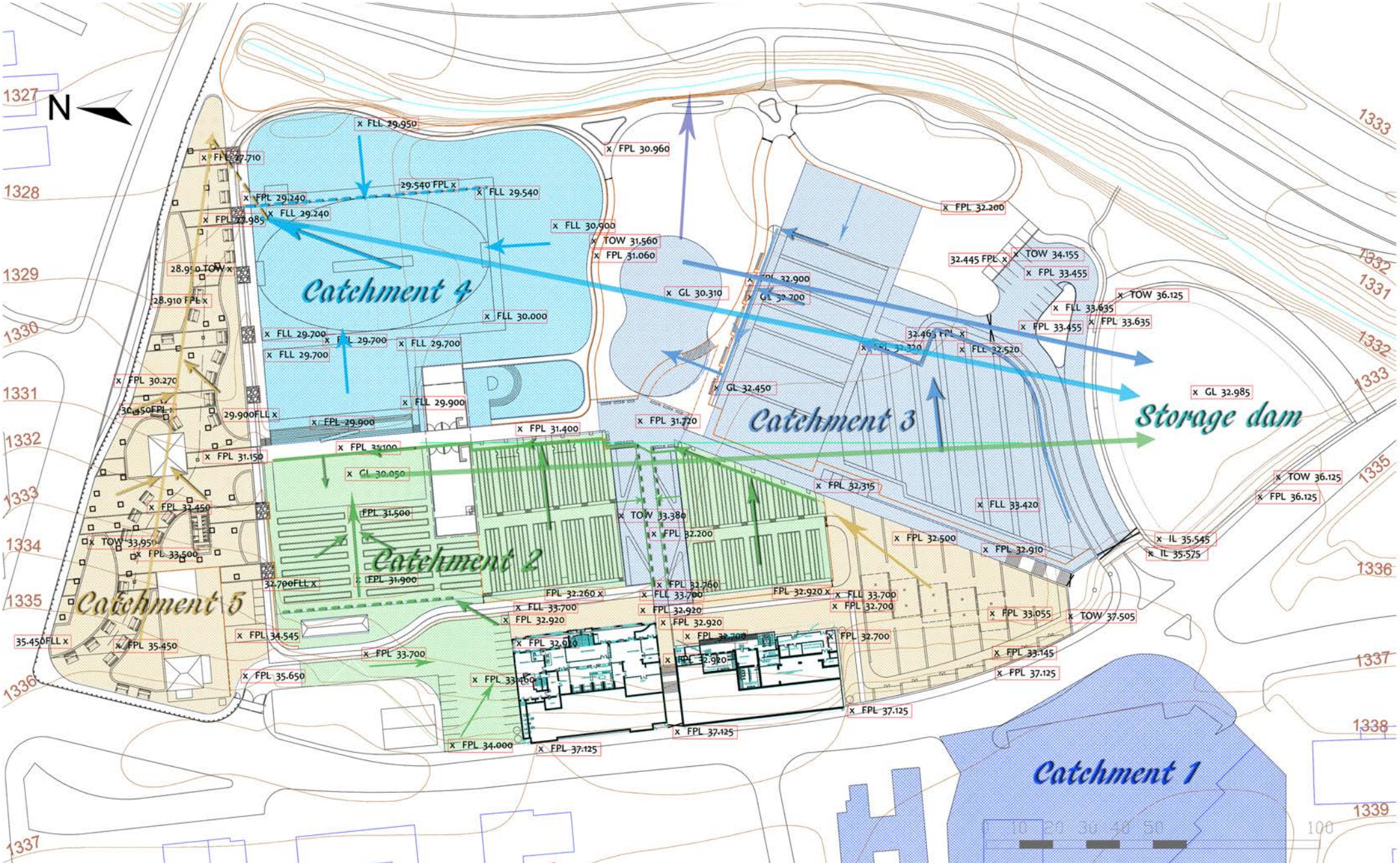

Fig. 162: Diagram of the water collection of the Water Strategy (Author, 2013)

7.4.2 Calculations

Water distribution calculations

A water budget was set up for the whole site (Refer to Table 9 and Fig. 163) and the size of the dam and wetlands were calculated accordingly (Refer to Table 10).

Water Budget Calculations					
WHOLE SITE (catchment 1,2,3, 4 & 5)					
	YEAR 1	YEAR 2			
	Harvestable water / month (m³) (from catchment 1)	**Harvestable water / month (m³) (from catchment 1, 2, 3, 4 & 5)**	**Total Irrigation Max. requirements / month (m³)**	**Balance**	**Total water in storage dam/ month (m³)**
	After Phase 1 (storage dam) was constructed; started with Phase 2	After Phase 2 was constructed & park started to function			
January	1 494.73	4 696.25	1 545.43	3 150.82	8 744.96
February	591.97	1 979.91	1 545.43	434.48	9 179.44
March	695.57	2 291.62	1 545.43	746.19	9 925.64
April	236.79	911.19	1 545.43	-634.24	9 291.39
May	-	198.71	1 545.43	-1 346.72	7 944.67
June	-	198.71	1 545.43	-1 346.72	6 597.95
July	-	198.71	1 545.43	-1 346.72	5 251.22
August	-	198.71	1 545.43	-1 346.72	3 904.50
September	-	198.71	1 545.43	-1 346.72	2 557.77
October	532.78	1 801.79	1 545.43	256.36	2 814.13
November	932.36	3 004.10	1 545.43	1 458.67	4 272.81
December	1 109.95	3 538.46	1 545.43	1 993.04	6 265.84
Water harvested during construction of Phase 2	**5 594.14**	**19 216.85**	**18 545.16**	**8 039.6**	

Table 9: Water budget calculations (Author, 2013)

Water budget

Year 1	January	February	March	April	May	June	July	August	September	October	November	December	Year 2 January	February	March	April	May	June	July	August	September	October	November	December
Harvestable water	1 494.73	591.97	695.57	236.79	-	-	-	-	-	532.78	932.36	1 109.95	4 696.25	1 979.91	2 291.62	911.19	198.71	198.71	198.71	198.71	198.71	1 801.79	3 004.10	3 538.46
Max. Irrigation Requirements (10% added)	-	-	-	-	-	-	-	-	-	-	-	-	1 545.43	1 545.43	1 545.43	1 545.43	1 545.43	1 545.43	1 545.43	1 545.43	1 545.43	1 545.43	1 545.43	1 545.43
Water sufficiency	1 494.73	591.97	695.57	236.79	-	-	-	-	-	532.78	932.36	1 109.95	3 150.82	434.48	746.19	-634.24	-1 346.72	-1 346.72	-1 346.72	-1 346.72	-1 346.72	256.36	1 458.67	1 993.03

Volume of water that needs to be stored for dry months	13 633.70	Volume of water needed during dry months	7 367.84

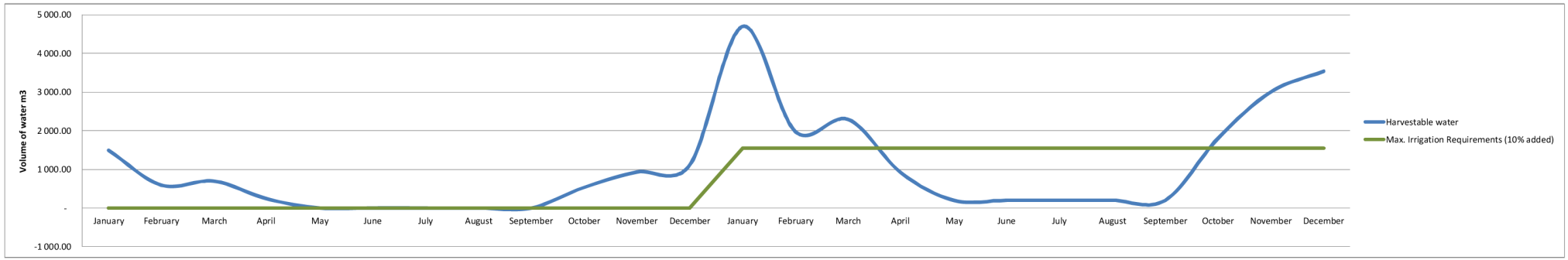

Fig. 163: Water Budget graph (Author, 2013)

Information of Storage dam and wetlands				
Name of dam	Height of Dam/ Depth of Wetland (m)	Area of dam (m^2)	Capacity (m^3)	Total Volume (m^3)
Storage dam - Deel 1	2.55	3 010.00	7 675.50	
Deel 2	2.1	1 200.00	2 520.00	10 195.50
	0	-	-	
Wetland 1 - Compost Area	1	1 230.00	1 230.00	(Back to Storage dam)
Wetland 2 - Agriculture area	1.2	680.00	816.00	(Back to Storage dam)
Soccer field	0	2 800.00	-	(Back to Storage dam)
Bioswale	0.2	803.28	160.66	

Table 10: Size of the dam and wetlands (Author, 2013)

Storm water calculations and a water budget for catchment 1 was completed (Refer to Chapter 11, Table 11 and 12) as well as the irrigation requirements for the agriculture, demonstration gardens, composting facility, waste cleaning facility and the recreational area (Refer to Chapter 11, Tables 13 and 14).

Water collection calculations

Storm water calculations and water budgets were completed for catchments 2 to 5 (Refer to Chapter 11, Tables 15 – 21). Grey water calculations were also done (Refer to Chapter 11, Table 22).

7.5 Sustainability Rating

7.5.1 SSI

The Sustainable Sites Initiative rating system was applied to rate the Berea Park intervention (Refer to Chapter 11, Table 23).