CHAPTER 6: DESIGN DEVELOPMENT

INTEGRATING M AN AND THE NATURAL ENVIRONMENT

HYPOTHESIS

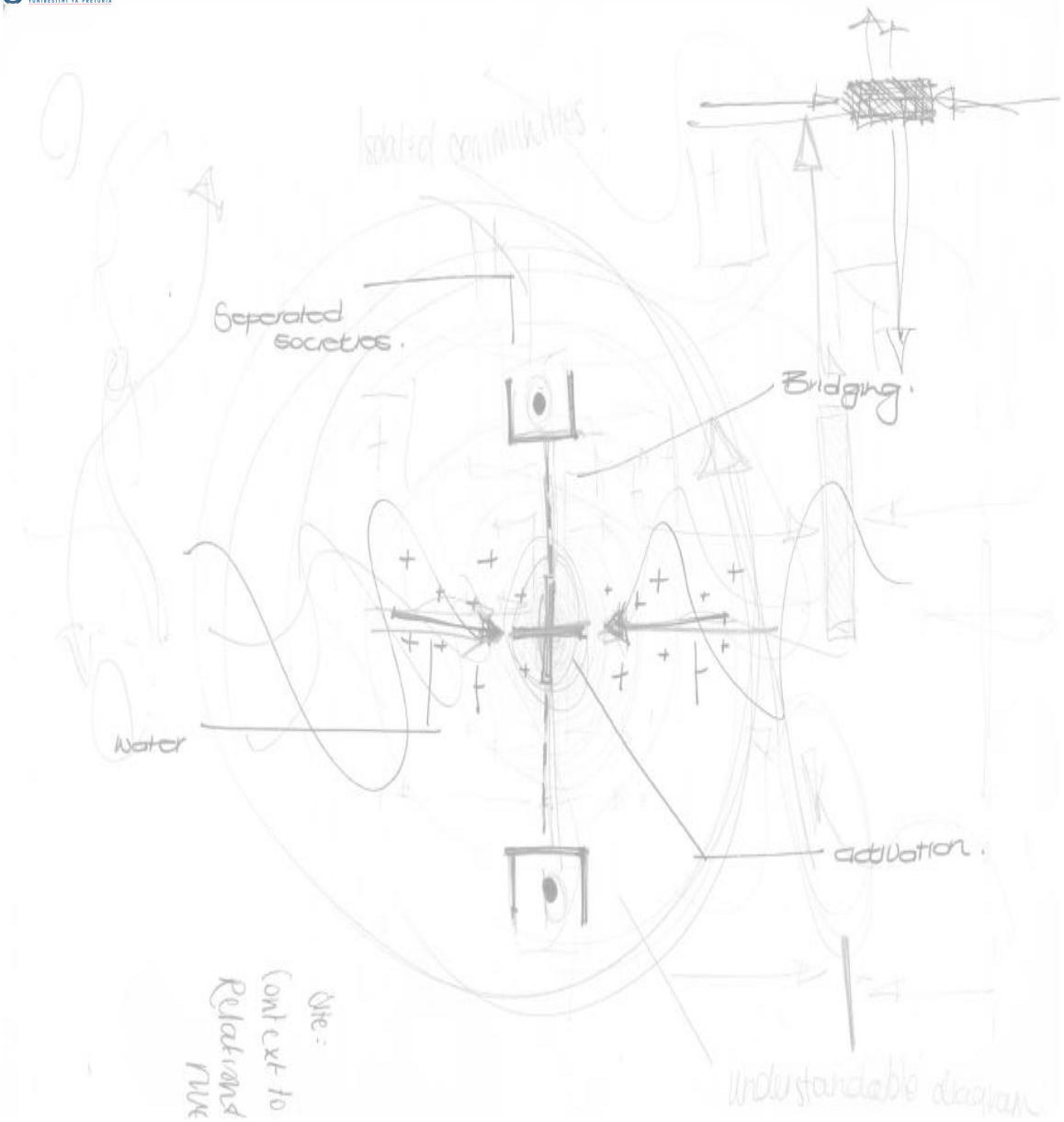
Integrating the public realm of the urban environment with areas of void or wasted landscape, through the use of rehabilitation systems and processes of the Moreleta Spruit as a design generator and informant for the site, will connect man on various levels to the natural and urban environments.

Through the incorporation of social, ecological and economic aspects, informed by the natural environment, the wasted landscape is transformed through the integration of the natural environment, into a public space centred on the interaction, education and awareness of the complexity and significance of urban river ecosystems.

DESIGN QUESTION

Can the rehabilitation of a polluted resource and the associated surrounding environment become a connecting feature with an impact on the surrounding environment?

Through enhancing the spatial quality of the rehabilitation process and incorporation of these processes into economic and social aspects of the intervention, will the public realm be drawn into the previously wasted landscape connecting man and the environment through common participation and experience?



CONTOUR MANIPULATION

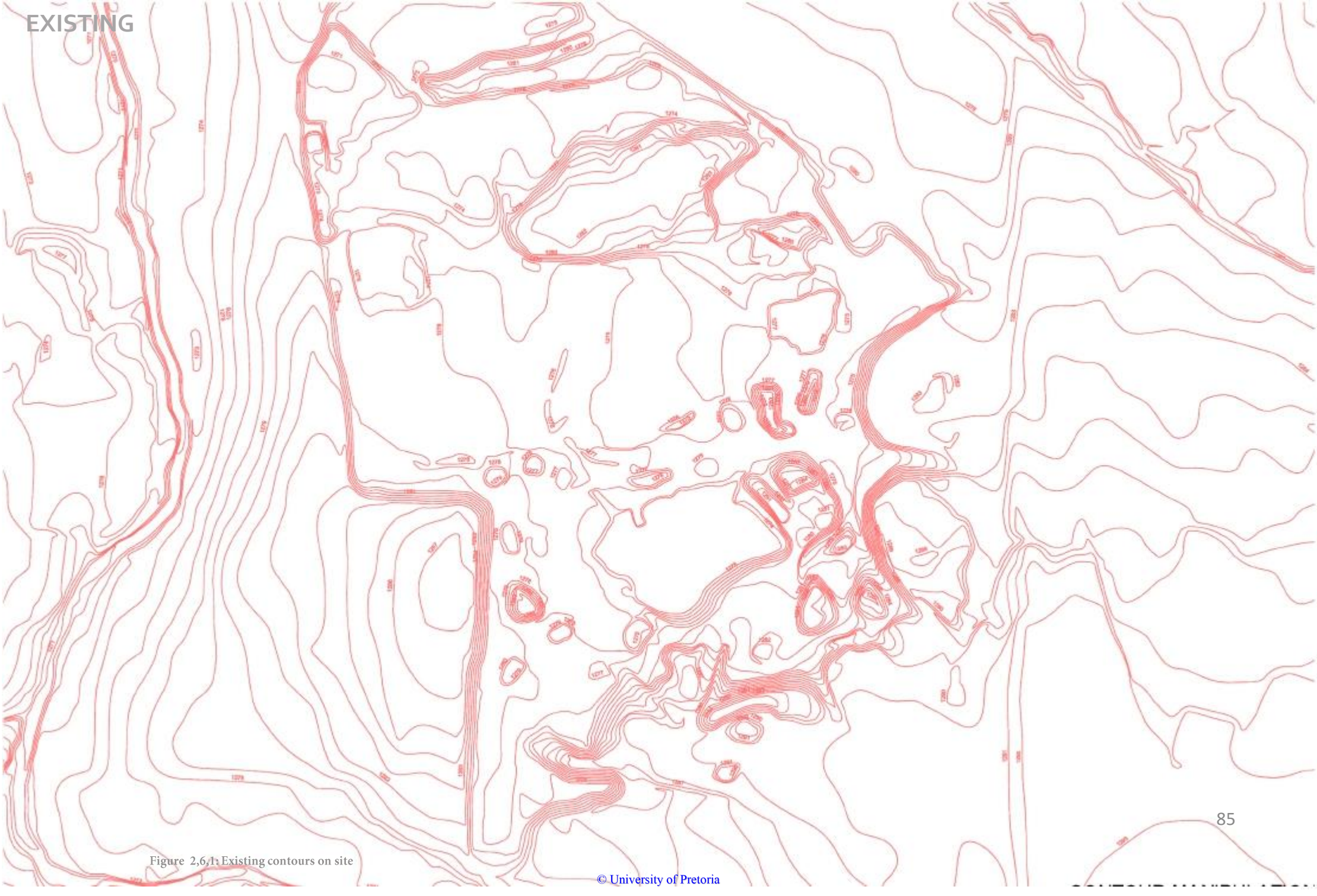


Figure 2,6,1: Existing contours on site

MANIPULATED

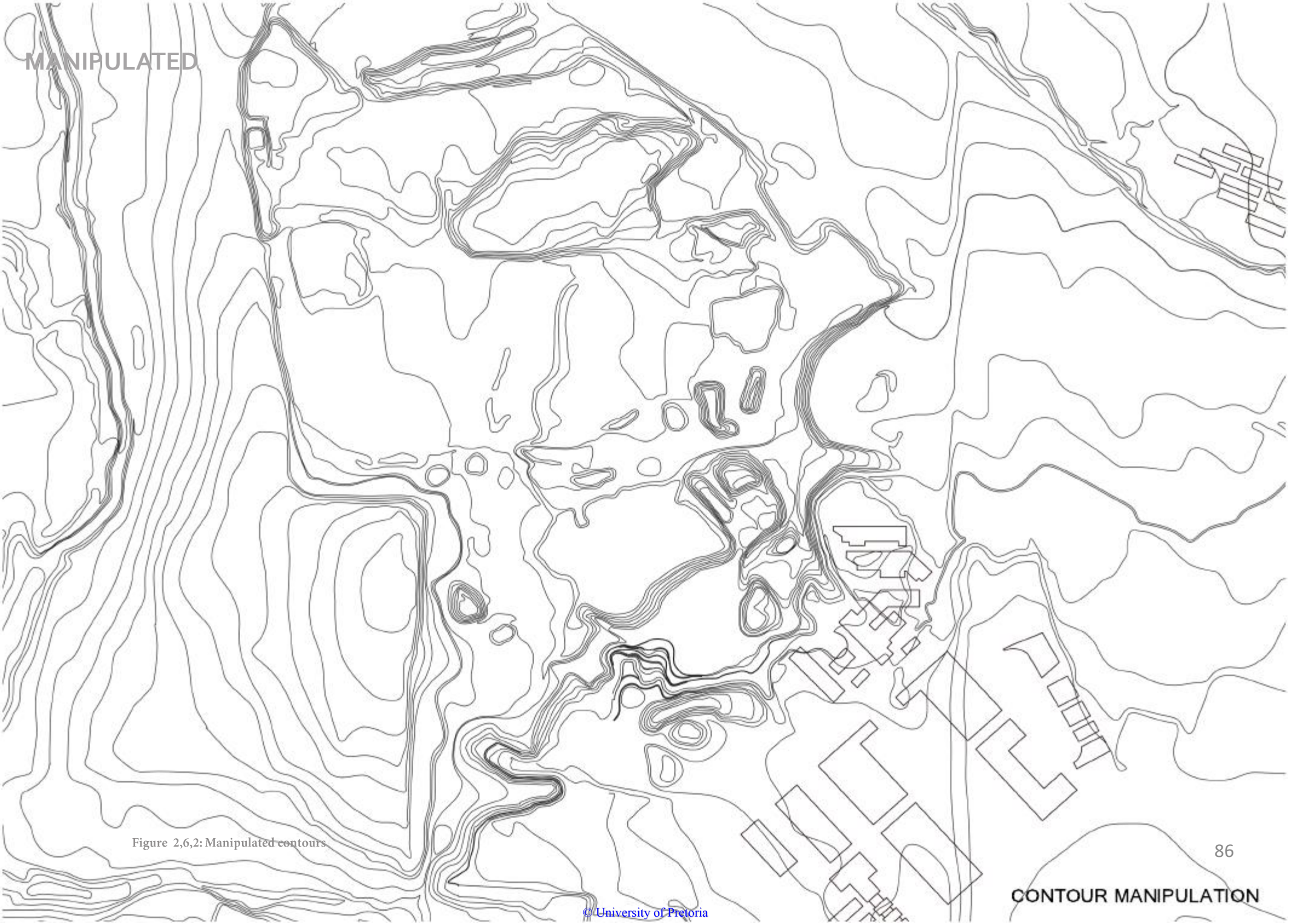
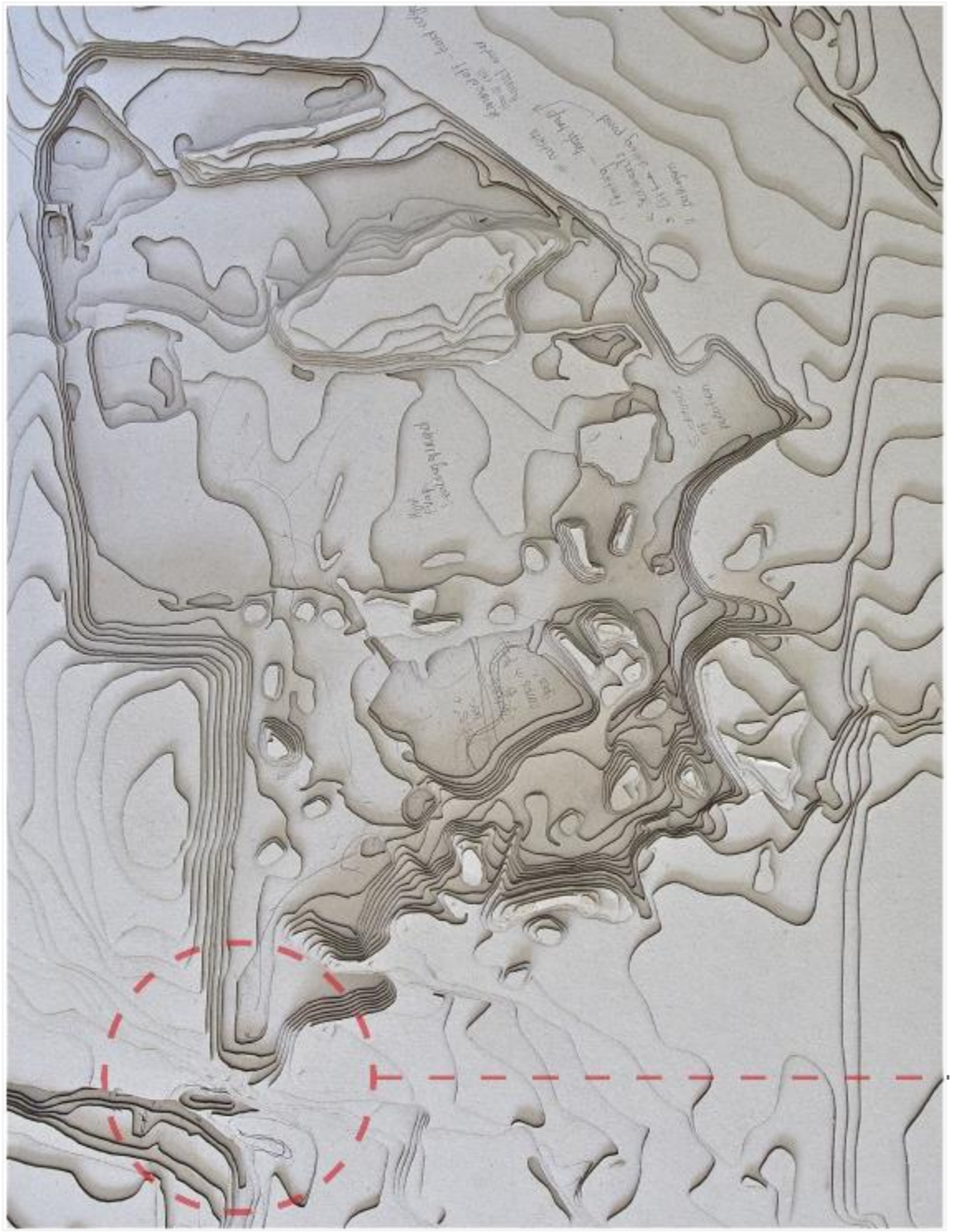


Figure 2,6,2: Manipulated contours



EXISTING CONTOURS BEFORE MANIPULATION FOR RIVER DIVERSION

Figure 2,6,3: Manipulated contours model investigation

The main contour manipulation which was required related to the diversion of the Moreleta Spruit in to the purification system designed in the Era Brick Works Quarry. The presence of a ridge as well as the change in levels from the river to the proposed purification was resolved by removing the ridge through the excavation and creation of a narrow channel through which water would be able to flow from the dam. The dam was a result of contour manipulation and alterations of water levels in the existing river system, the dam allowed for the raising of the water level for the free flow water system in to the purification channels and wetlands.

Figure 2,6,4: Main river diversion manipulation

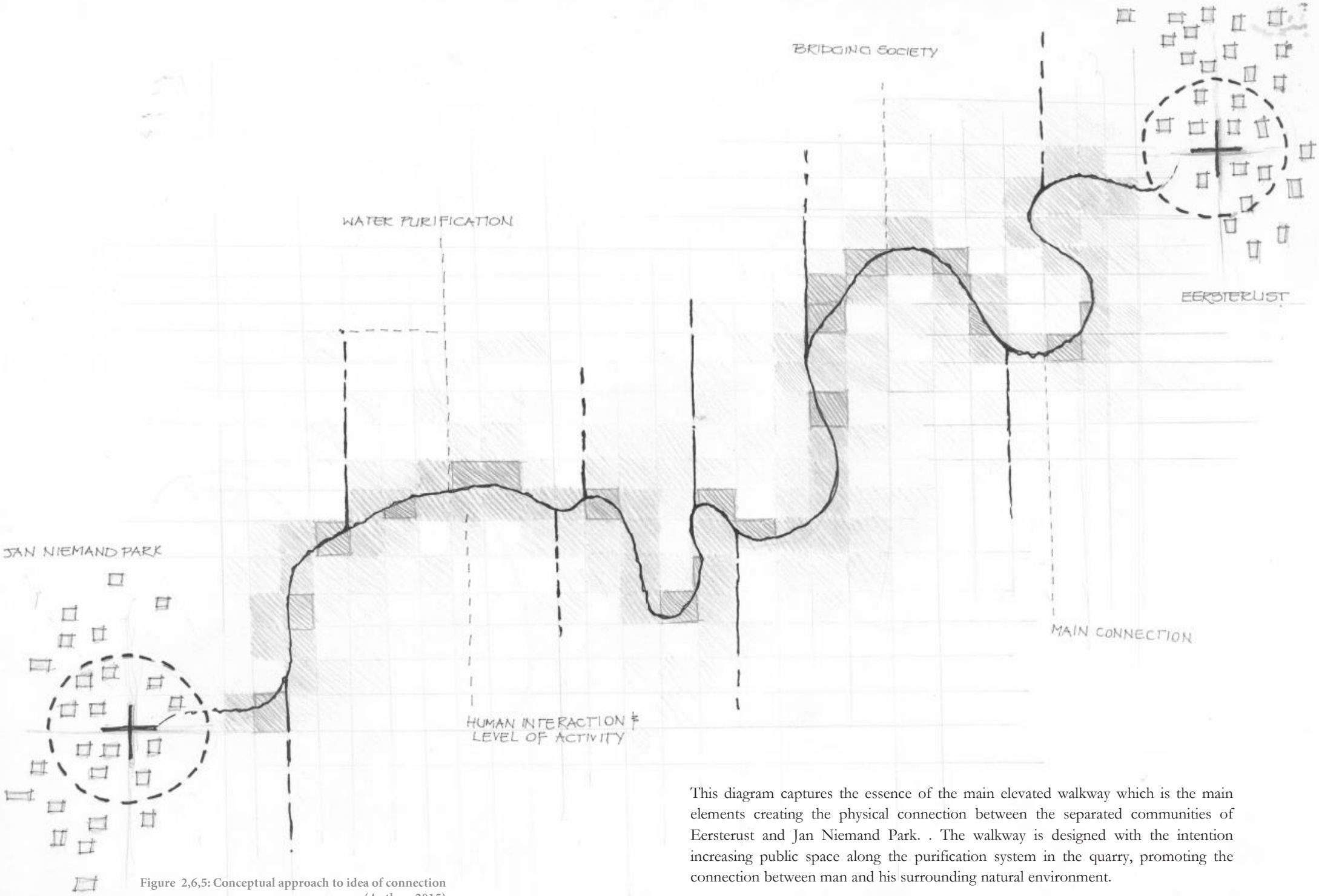


Figure 2,6,5: Conceptual approach to idea of connection (Author, 2015)

This diagram captures the essence of the main elevated walkway which is the main elements creating the physical connection between the separated communities of Eersterust and Jan Niemand Park. . The walkway is designed with the intention increasing public space along the purification system in the quarry, promoting the connection between man and his surrounding natural environment.

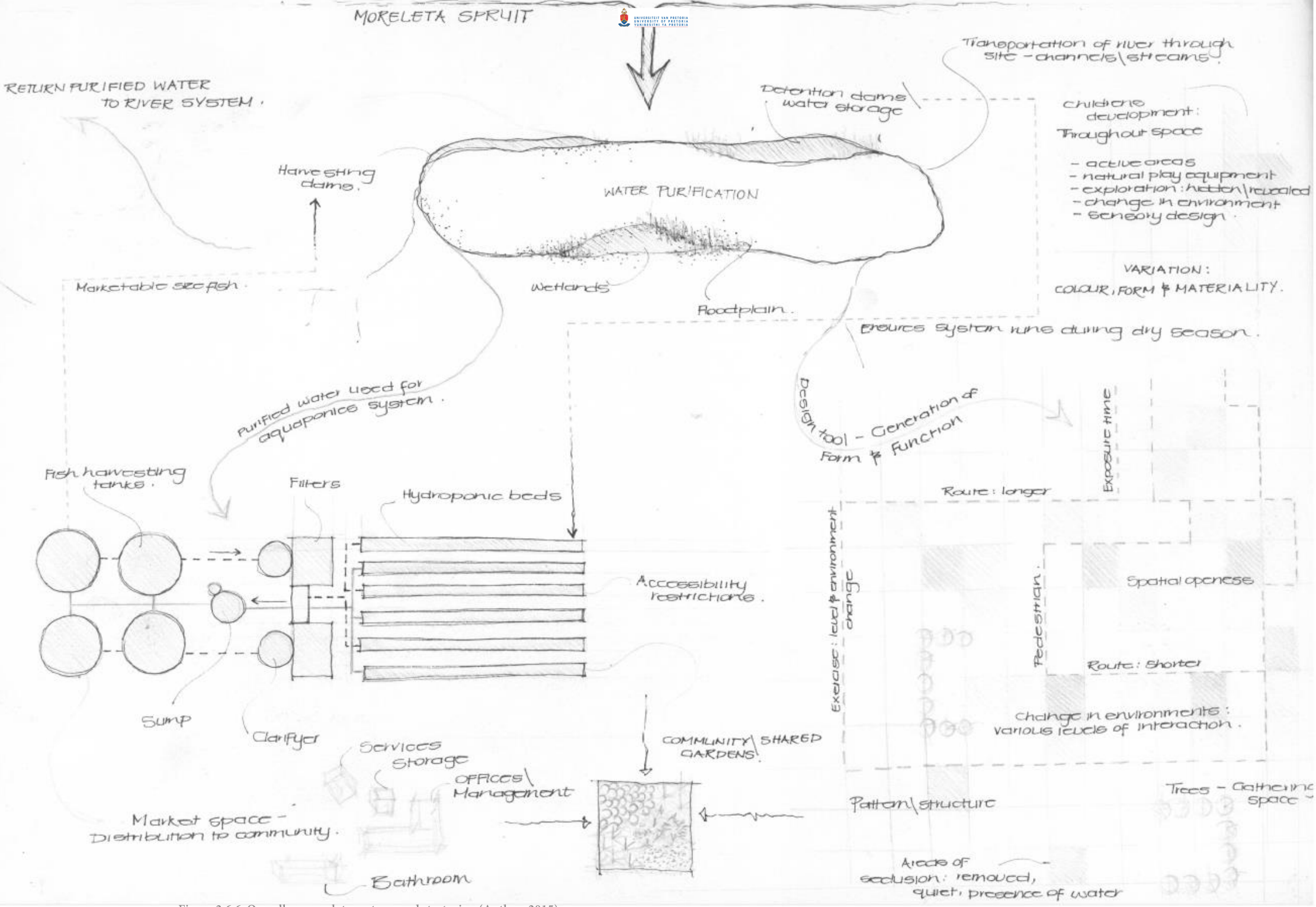


Figure 2,6,6: Overall approach to systems and strategies. (Author, 2015)

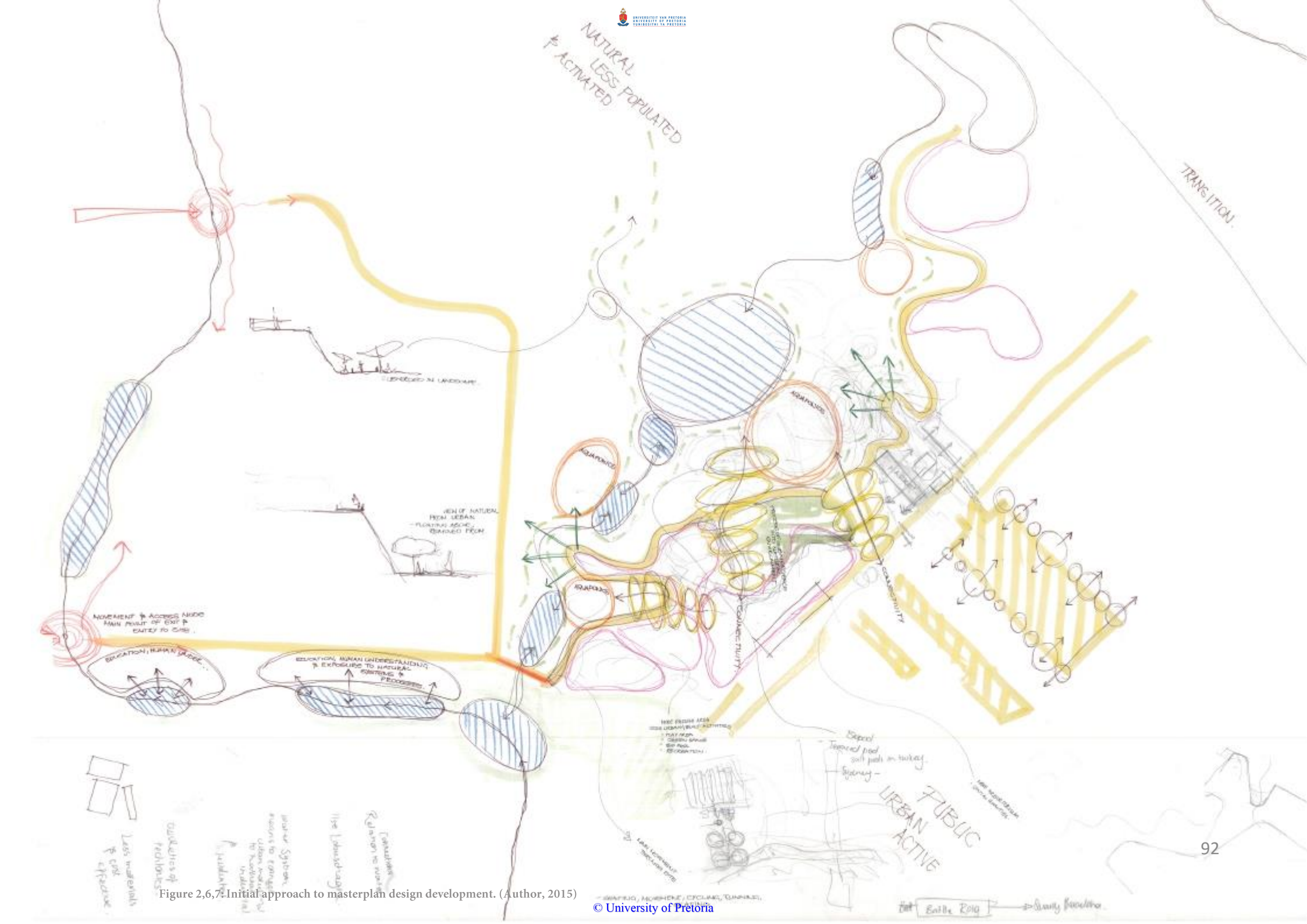
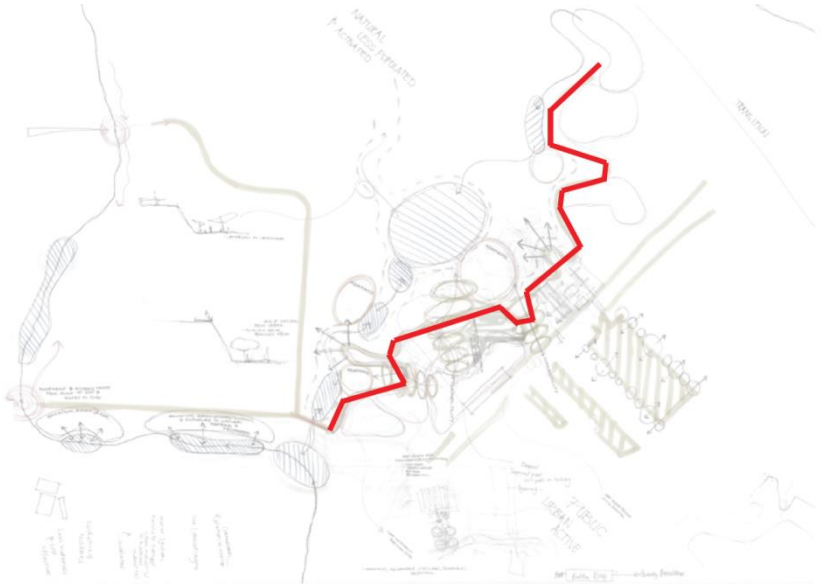
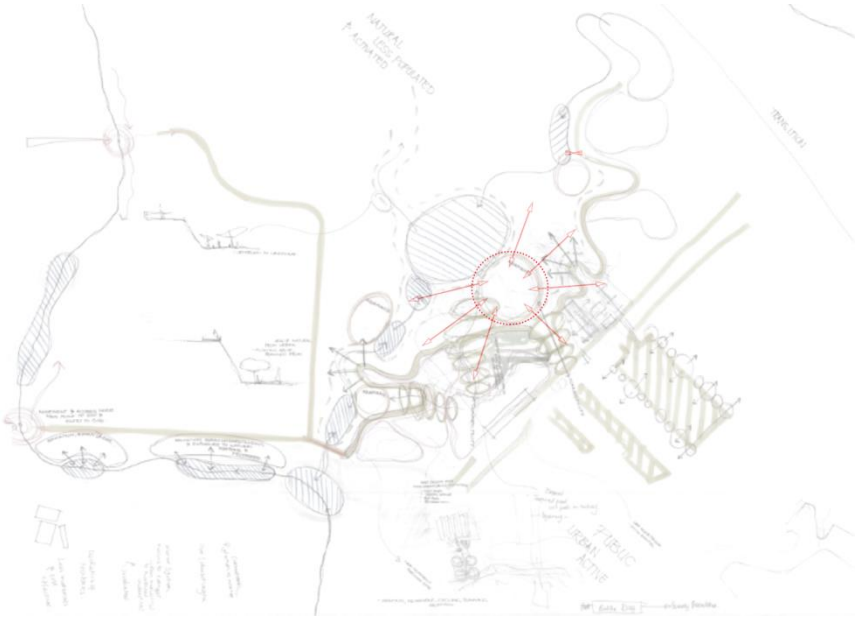


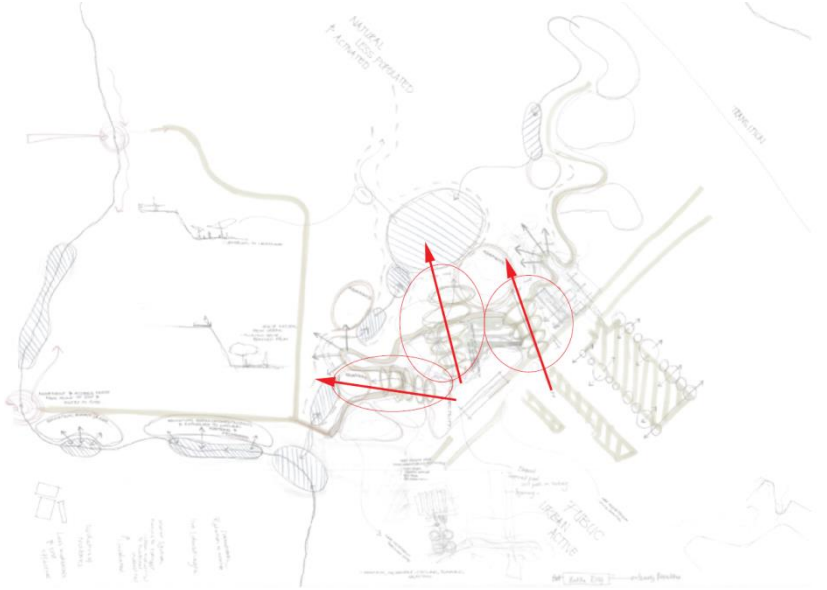
Figure 2,6,7: Initial approach to masterplan design development. (Author, 2015)



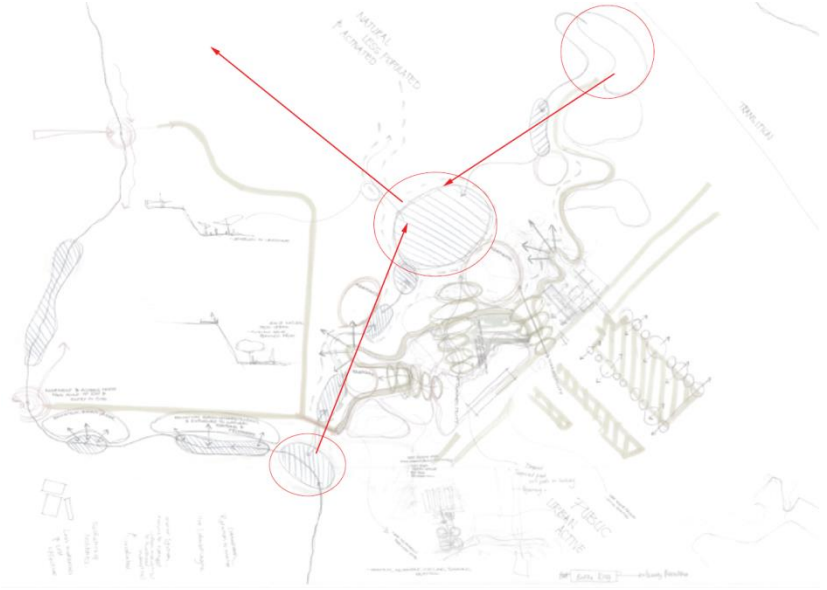
The physical connection created by the walkway, a solid constructed element within the landscape directly connecting separated societies.



The choice of event space and main lawn area is central to the design with easy movement and accessibility between both industrial, commercial and natural environments. A connection node between all three.



The points of connection between the higher levels (industrial and commercial area) are guided through the systems and processes of water, connecting to the lower levels or natural environment. The process of immersion in nature.



The main connection is the visual connection between the separated societies created through the merging of two river systems in to the purification system in the quarry. This visual connection gives the impression of the merging and convergence of societies and communities.

Figure 2.6.8: Evaluation and development of masterplan intention. (Author, 2015)

DESIGN DEVELOPMENT

The design development clearly demonstrates the hierarchy of connectivity, initially starting with the diversion of river systems and the integration of the purification system in to the quarry. Slowly progressing to the design and development of the industrial and commercial sector of the design. Integration of previously proposed interventions with the vision and intention of the idea of connectivity between social, environmental and economic aspects. The bridge or main walkway through the site developed as a prominent connection within the design and from there activities and public space was created linking to and from the walkway.

Figure 2.6.9: Master plan development and iteration (Author, 2015)

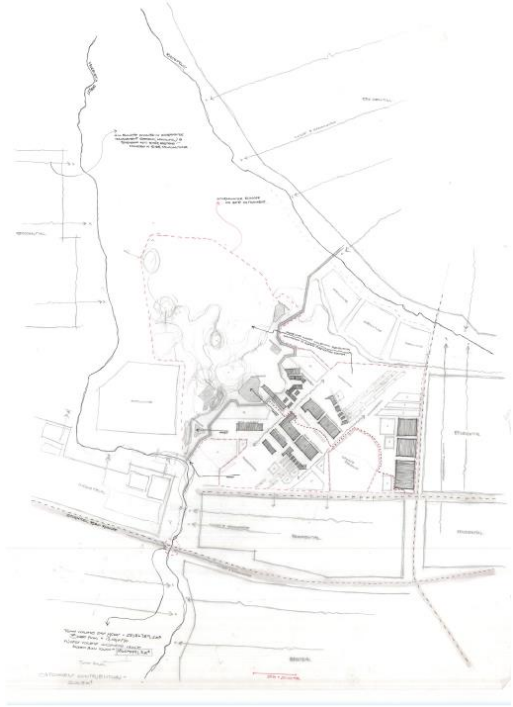


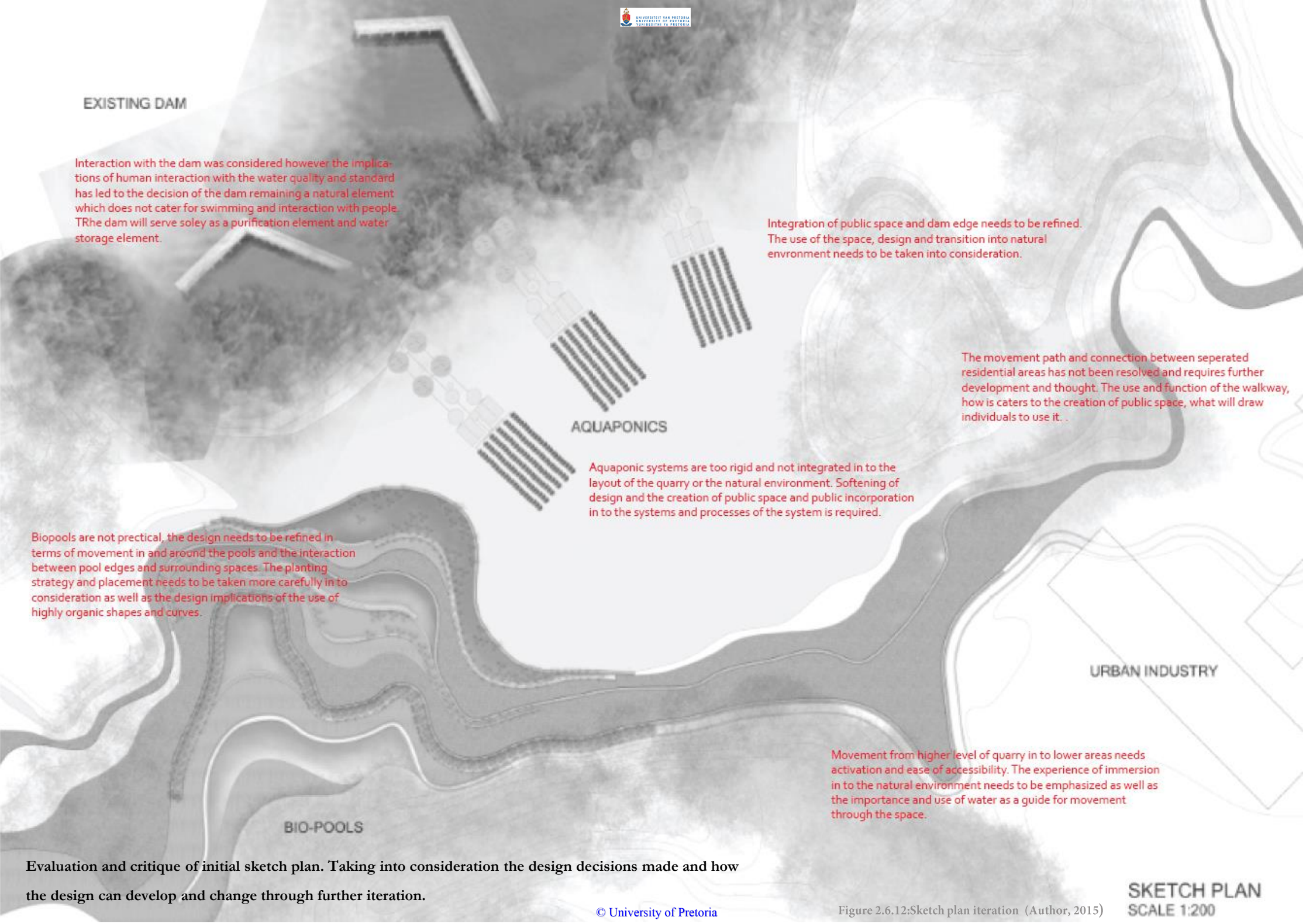
Figure 2.6.10: Final Master plan proposal. (Author, 2015)

MASTER PLAN

SCALE 1: 1000

SKETCH PLAN DEVELOPMENT

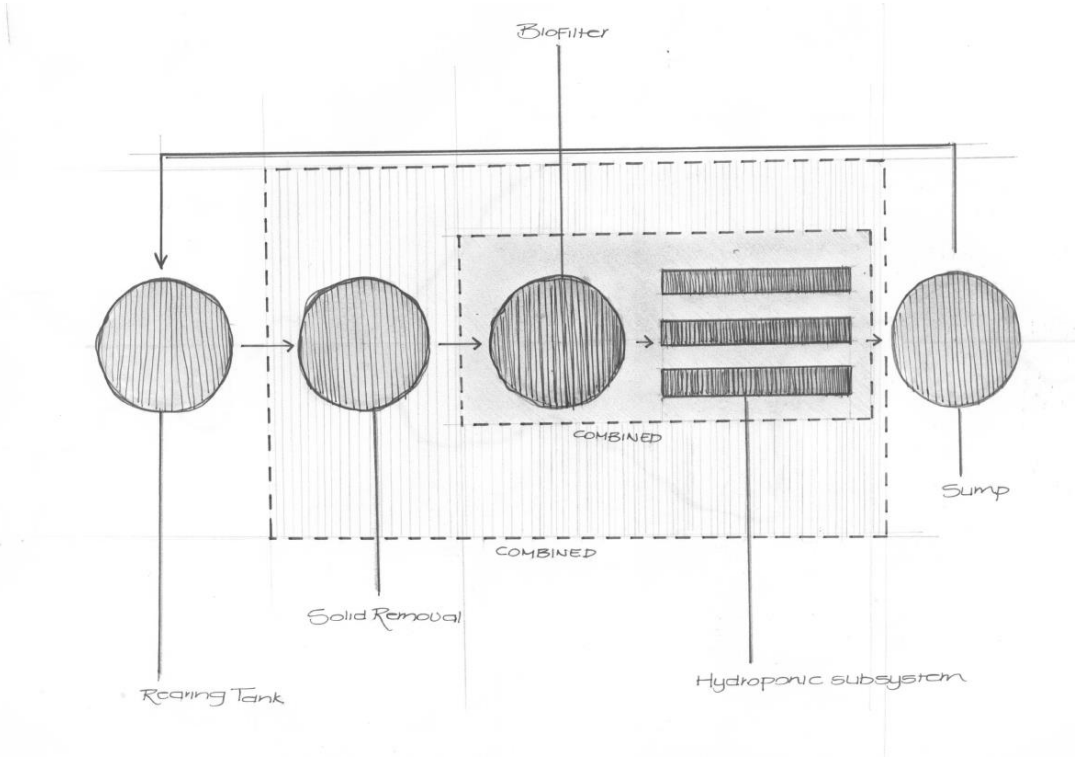
Figure 2.6.11: Sketch plan development. (Author, 2015)



Evaluation and critique of initial sketch plan. Taking into consideration the design decisions made and how the design can develop and change through further iteration.

Figure 2.6.12:Sketch plan iteration (Author, 2015)

SKETCH PLAN
SCALE 1: 200

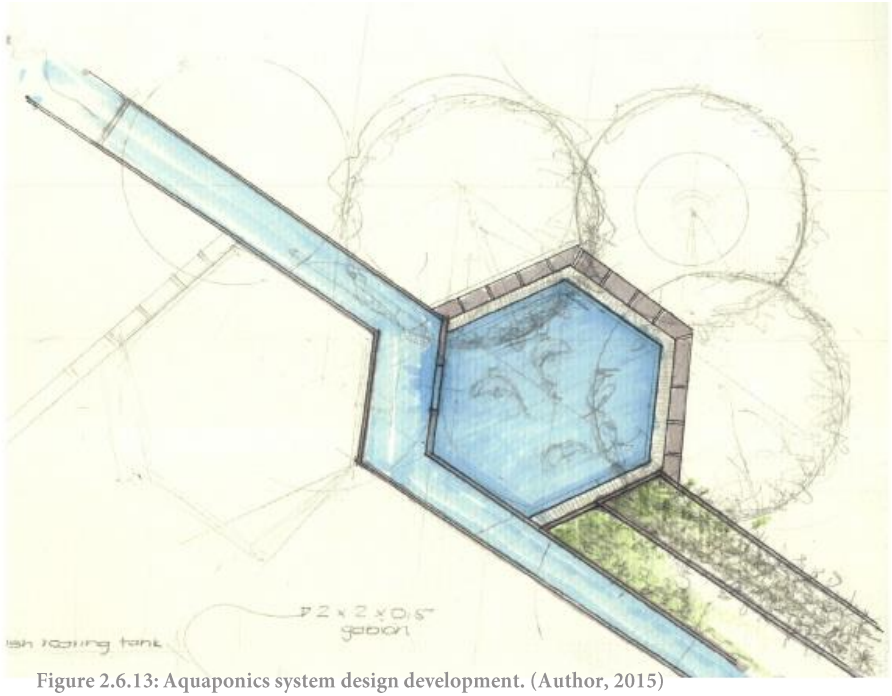


SYSTEM DESIGN DEVELOPMENT: AQUAPONICS

Understanding the systems and processes of the aquaponics system allowed for the redesign and development of such a system for the integration into the site for both form and function. The main intention with the incorporation of the aquaponics system, in addition to the economical benefits through the use of natural water systems, was the creation of public space and the promotion of human interaction with the productive landscape.

The development of a spatial system with which people would feel connected to and immersed in the natural environment would require the exposure of the hidden elements and systems of the aquaponics system. The initial design investigation drew inspiration from the surrounding proposed natural industries, in particular, the apiary. The hexagonal approach opened up the system through the creation of modular units which fit into and create spaces between one another.

The design did not respond well to the nature of the site in terms of the industrial feel and atmosphere of the quarry. The design required more integration with the slopes and drastic change in level which it was not as flexible to as the final design.



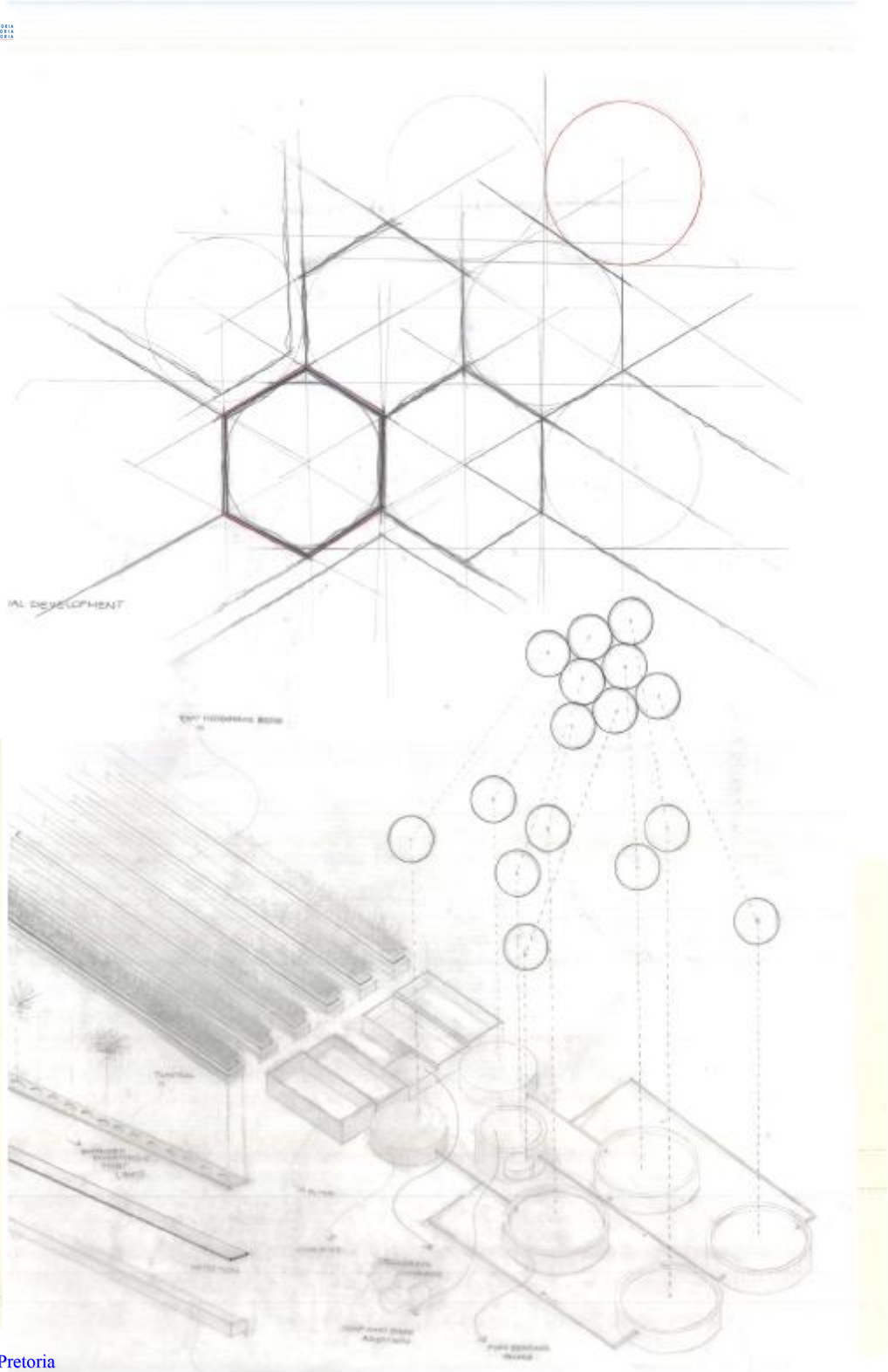


Figure 2.6.13: Aquaponics system design development. (Author, 2015)

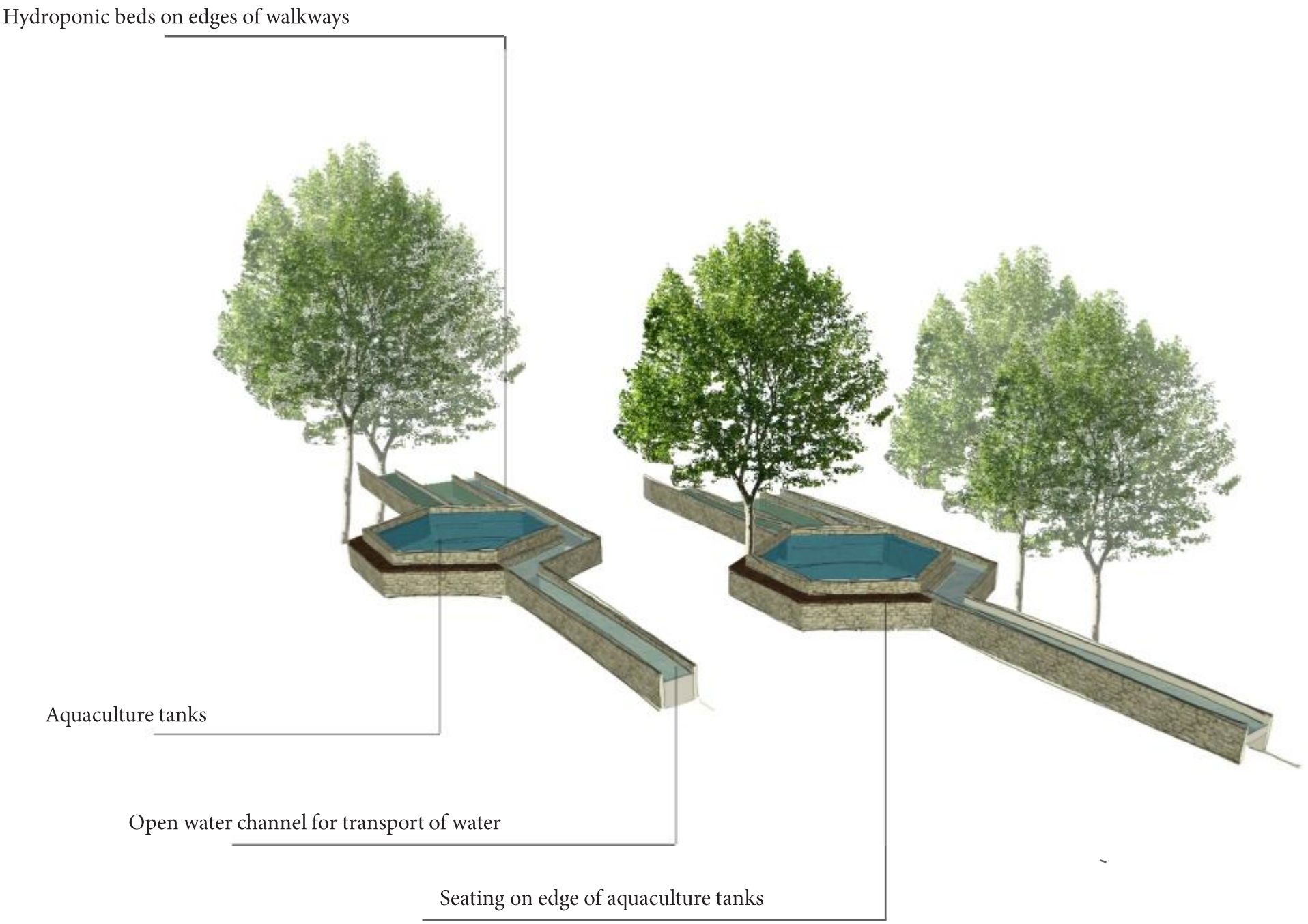
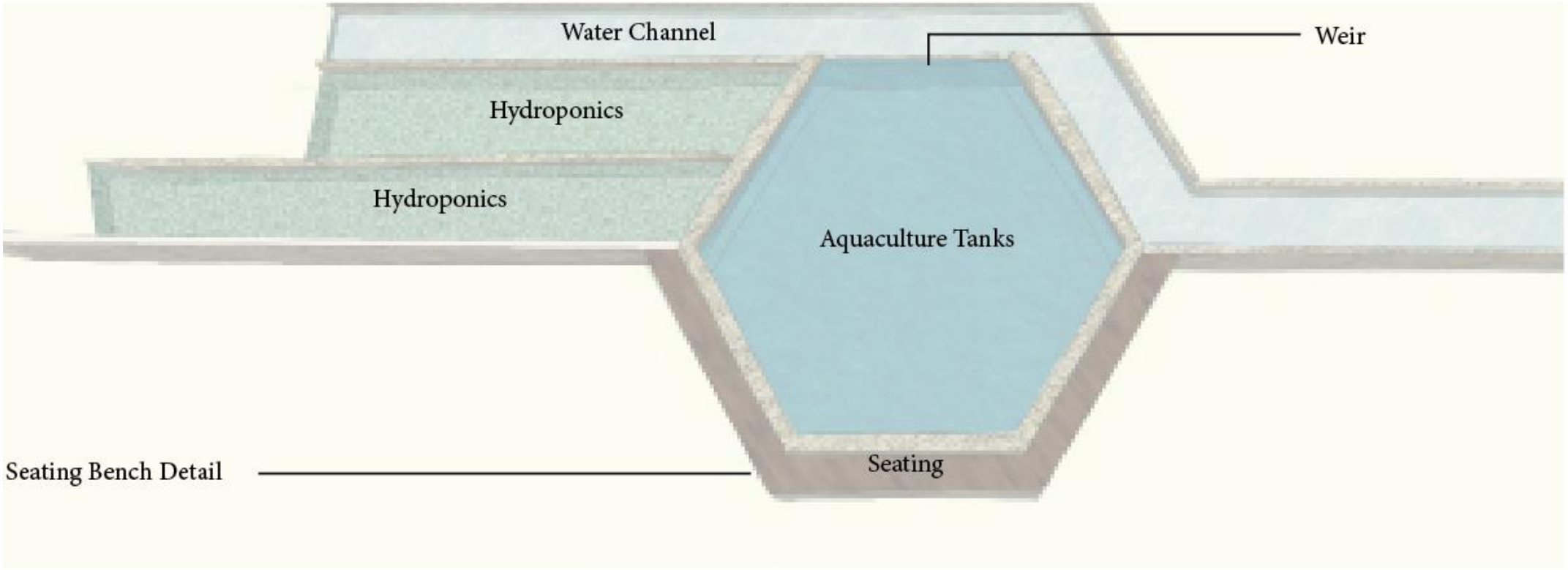
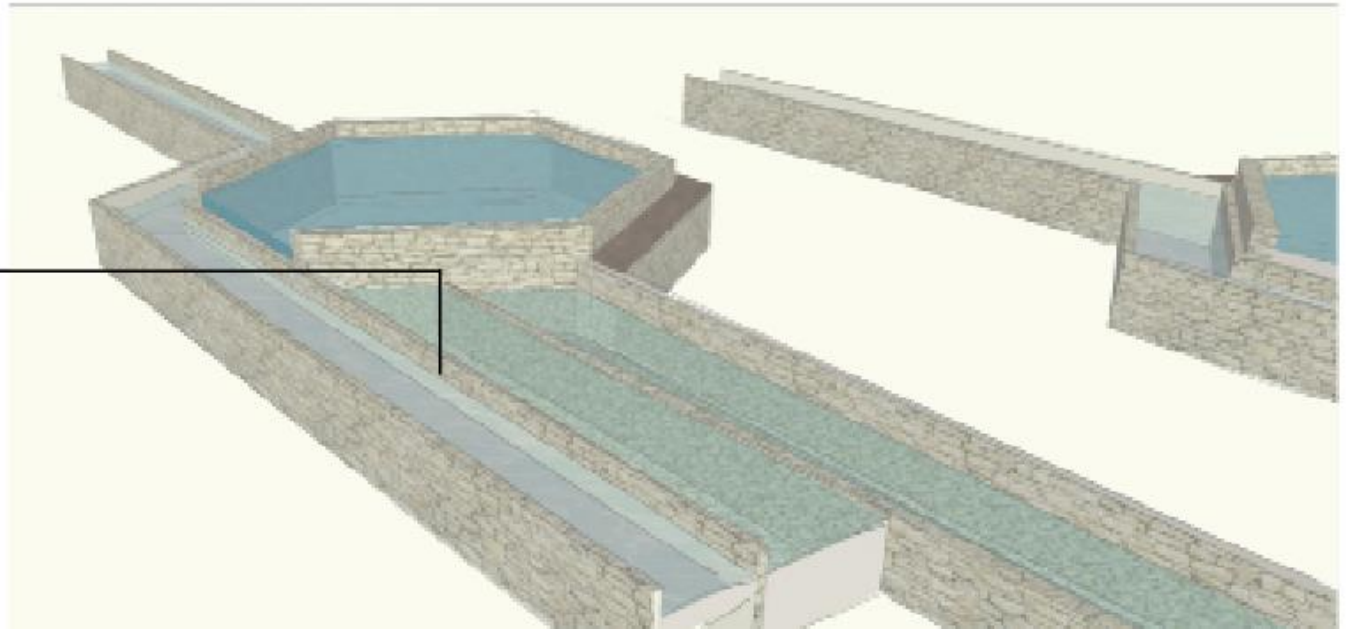


Figure 2.6.14: 3D development of Aquaponics elements(Author, 2015)



Water Channel Detail



THE AQUAPONICS SYSTEM REQUIRES CERTAIN SYSTEMS AND PROCESSES FOR THE MAINTENANCE AND PURIFICATION OF THE WATER WITHIN THE SYSTEM. THESE SERVICES INCLUDE TWO CLARIFIERS, FOUR FILTERS AND A DEGASSING TANK. THESE HAVE BEEN INCORPORATED IN TO THE DESIGN IN A MANNER WHICH HAS COVERED THE SERVICES UP AND SERVES AS A SEATING SPACE WITHOUT PROHIBITING OR INFLUENCING THE FLOW OF WATER FROM THE AQUACULTURE TANKS TO THE HYDROPONIC BEDS.

LAWN AREA AND EVENT SPACE. THIS AREA WILL CATER FOR THE HOSTING OF EVENTS SUCH AS MARKETS, FESTIVALS, LIVE MUSIC, ETC.

ACCESSIBLE GREEN ROOF. THE ROOFS ARE RESPONSIBLE FOR THE PROVISION OF SHADE FOR SEATING SPACES BELOW AS WELL AS WIDENING THE ADJACENT WALKWAYS. INCREASED PUBLIC SPACE FOR BOTH MOVEMENT AND LINGERING.

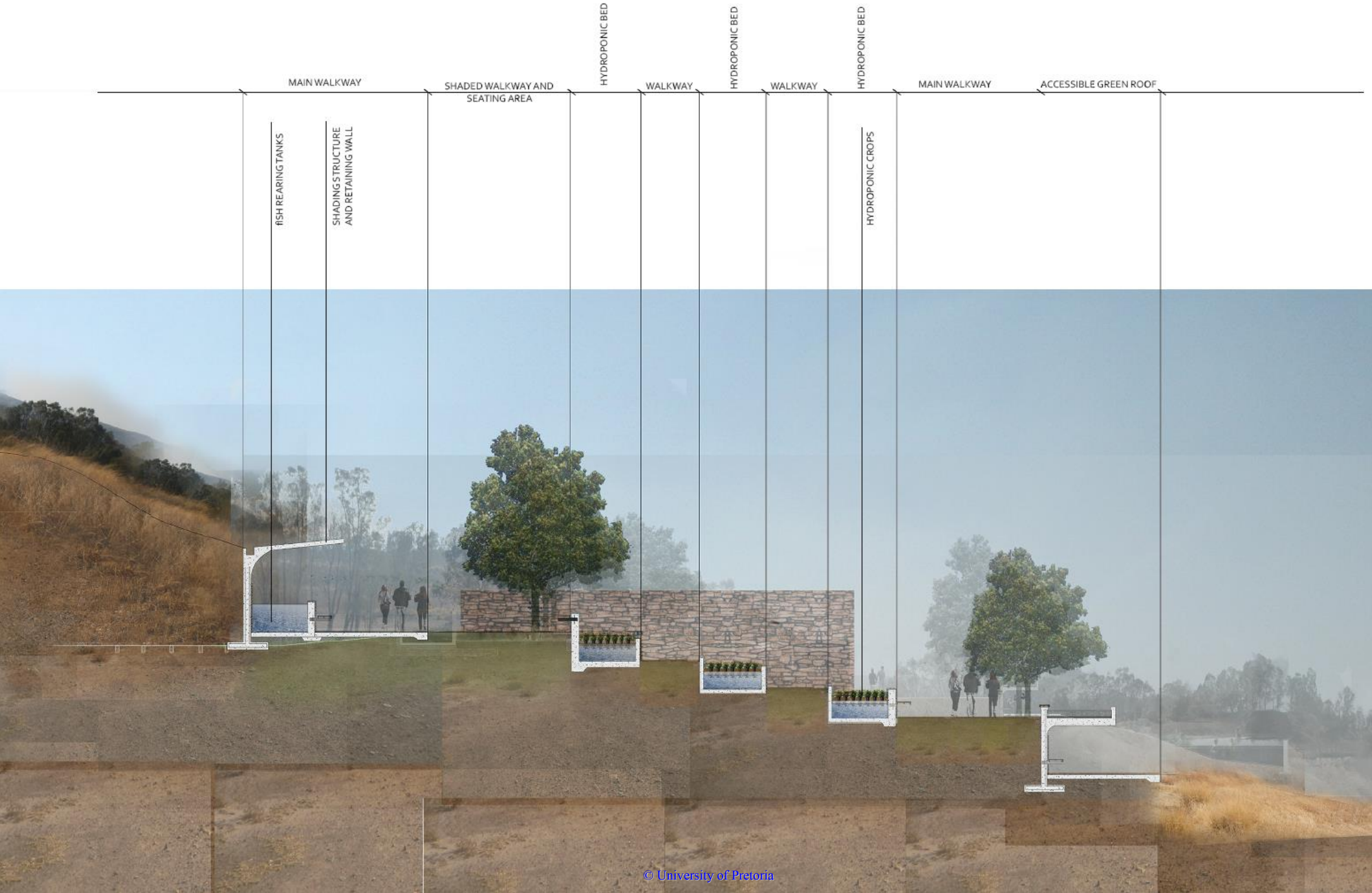
HYDROPONIC BEDS ARE TERRACED IN TO THE QUARRY EDGE, AIDING IN THE TRANSPORTATION OF WATER THROUGH GRAVITY FLOW. THE TERRACED BEDS PROVIDE FOR SEATING SPACES AS WELL, ALLOWING FOR PUBLIC INTERACTION AND EXPOSURE TO THE SYSTEMS AND MEANS OF PRODUCTION.

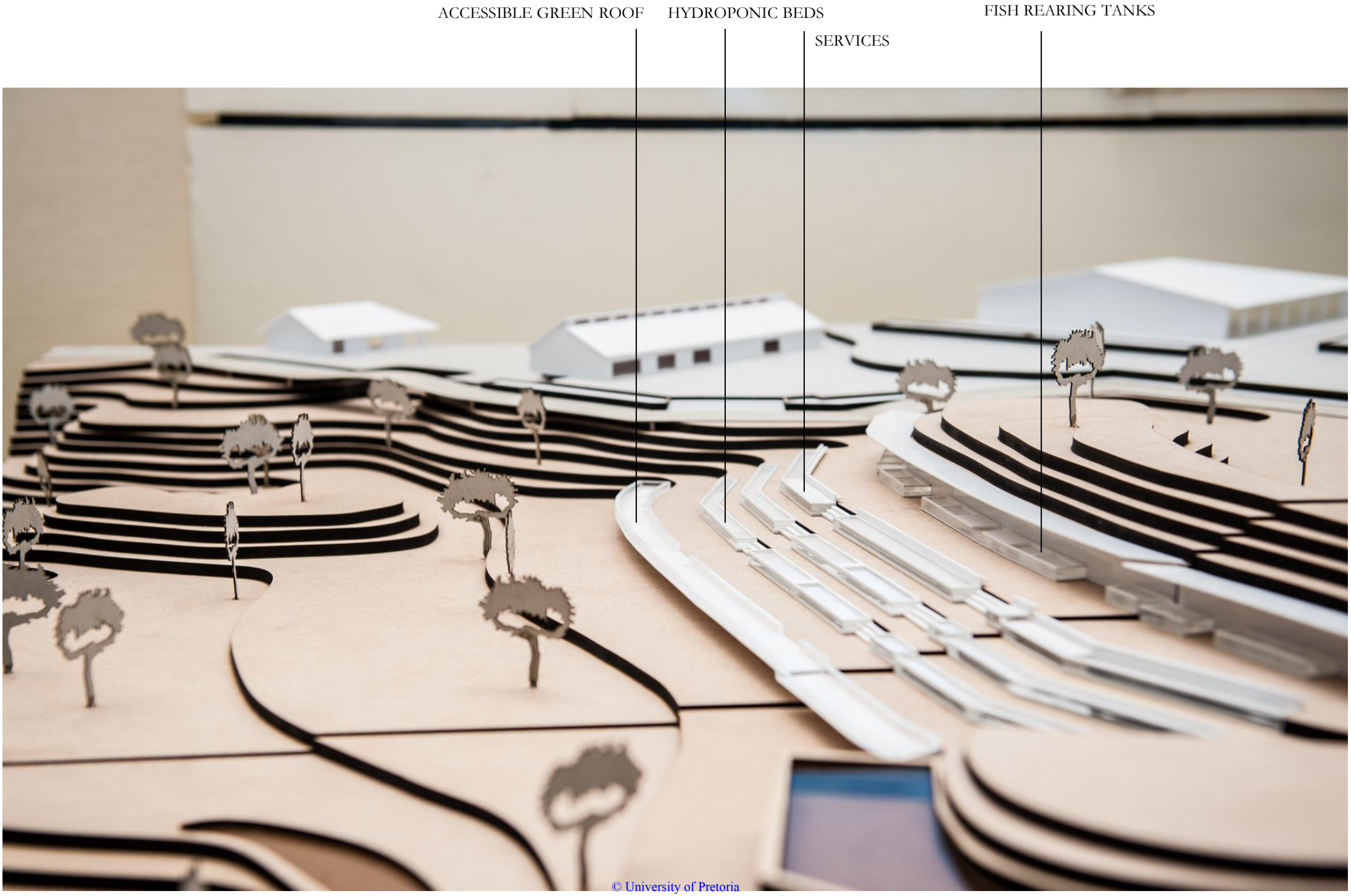
AQUACULTURE TANKS OR FISH HARVESTING TANKS. THESE TANKS HAVE BEEN CONSTRUCTED IN TO THE SIDE OF THE MOUNTAIN AT THE HIGHEST POINT OF THE SYSTEM. THE FISH REQUIRE SHADE WHICH IS PROVIDED BY THE EXTENDED ROOF FROM THE RETAINING WALL. THE WATER IS GRAVITY FED FROM THE AQUACULTURE TANKS THROUGH THE FILTRATION SYSTEM AND IN TO THE HYDROPONIC BEDS. IF ADDITIONS WATER IS REQUIRED DUE TO EVAPORATION LOSS OR USE IN THE SYSTEM, WATER IS TAKEN FROM THE EXISTING DAM.

THE WATER PATH TRAVELS FROM THE AQUACULTURE TANKS THROUGH 50 DIAMETER PVC PIPING INTO THE CLARIFIERS, FILTERS AND DEGASSING TANK. THE WATER IS THEN GRAVITY FED IN TO THE HYDROPONIC BEDS WHERE IT IS RESPONSIBLE FOR THE GROWTH OF VARIOUS AGRICULTURAL CROPS. THROUGH FURTHER GRAVITY FLOW THE WATER IS TRANSPORTED TO A SUMP AND BASE ADDITION TANK FROM WHERE IS IT RECIRCULATED AND PUMPED BACK TO THE AQUACULTURE TANKS.

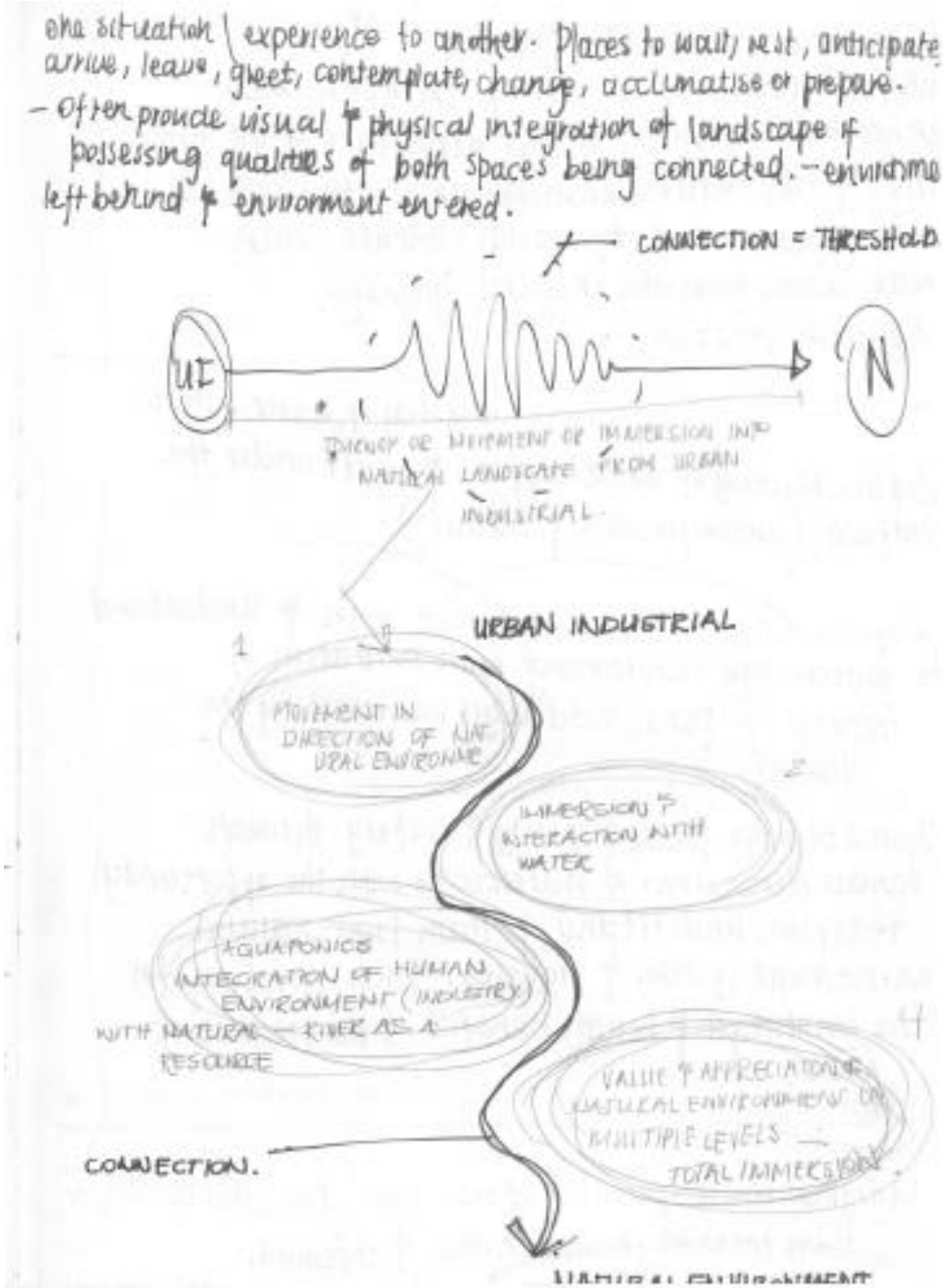
Figure 2.6.15: Aquaponics system explanation(Author, 2015)

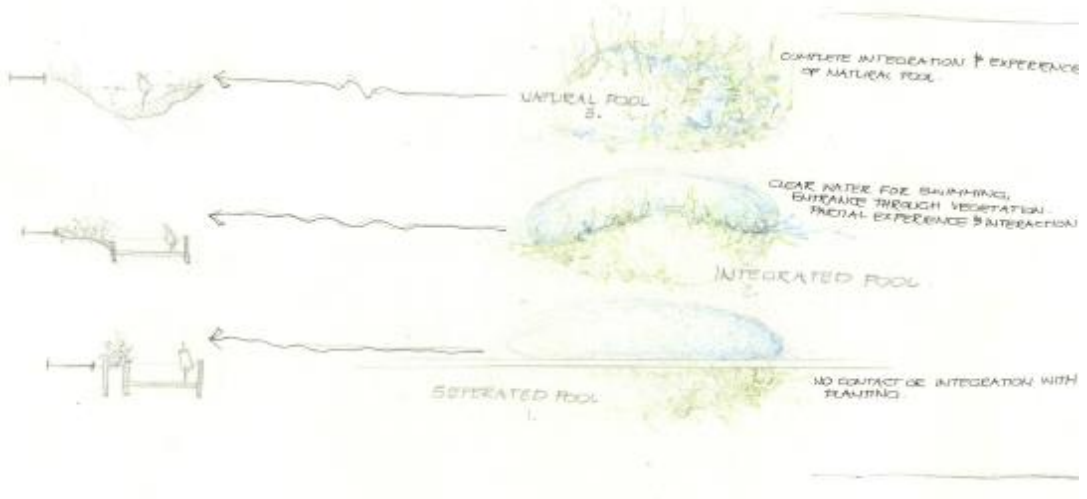
Figure 2.6.16: Section through aquaponics system (Author, 2015)





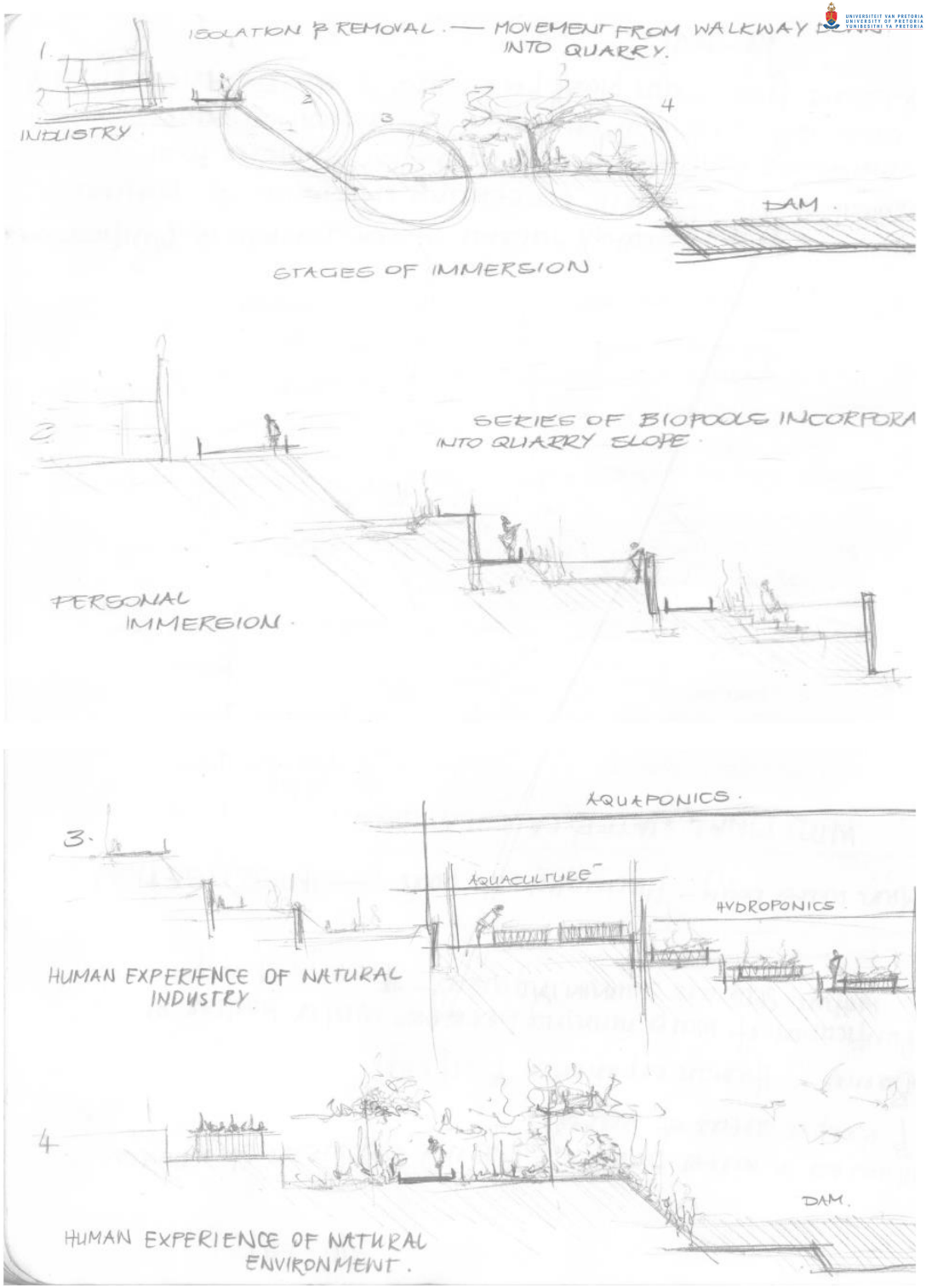
SYSTEM DESIGN DEVELOPMENT: BIOPOOLS

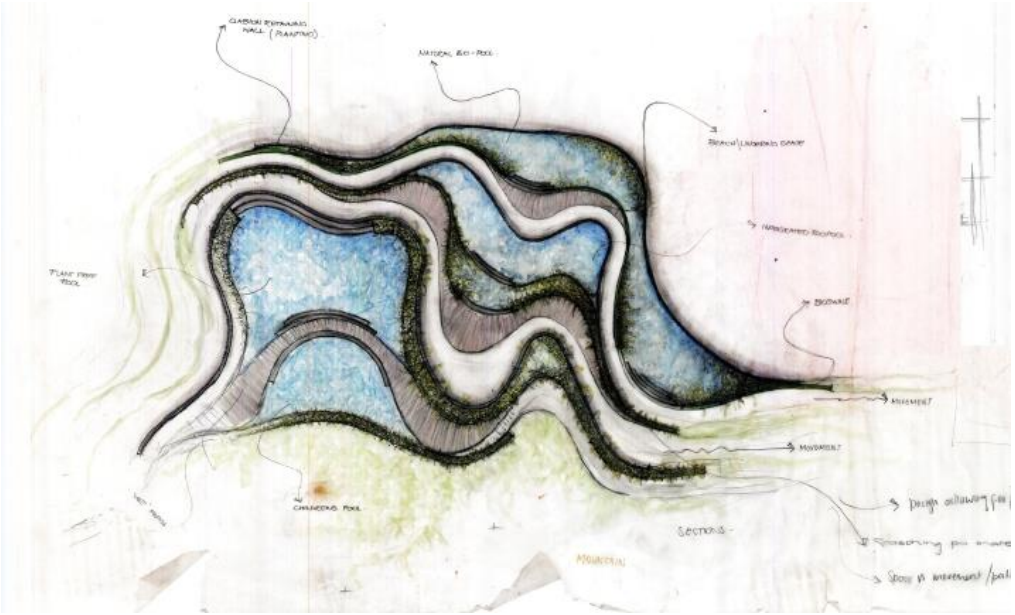




The movement paths that allow for pedestrian traffic moving from the higher levels to the lower levels are emphasized and directed by the presence of water systems and processes. The incorporation of terraced biopools allows for a public interface between the industrial and natural environments. Making use of the purified water from the purification system in the quarry, the recirculating systems are focused on the process of immersion of the user in the natural environment and they move down in to the quarry.

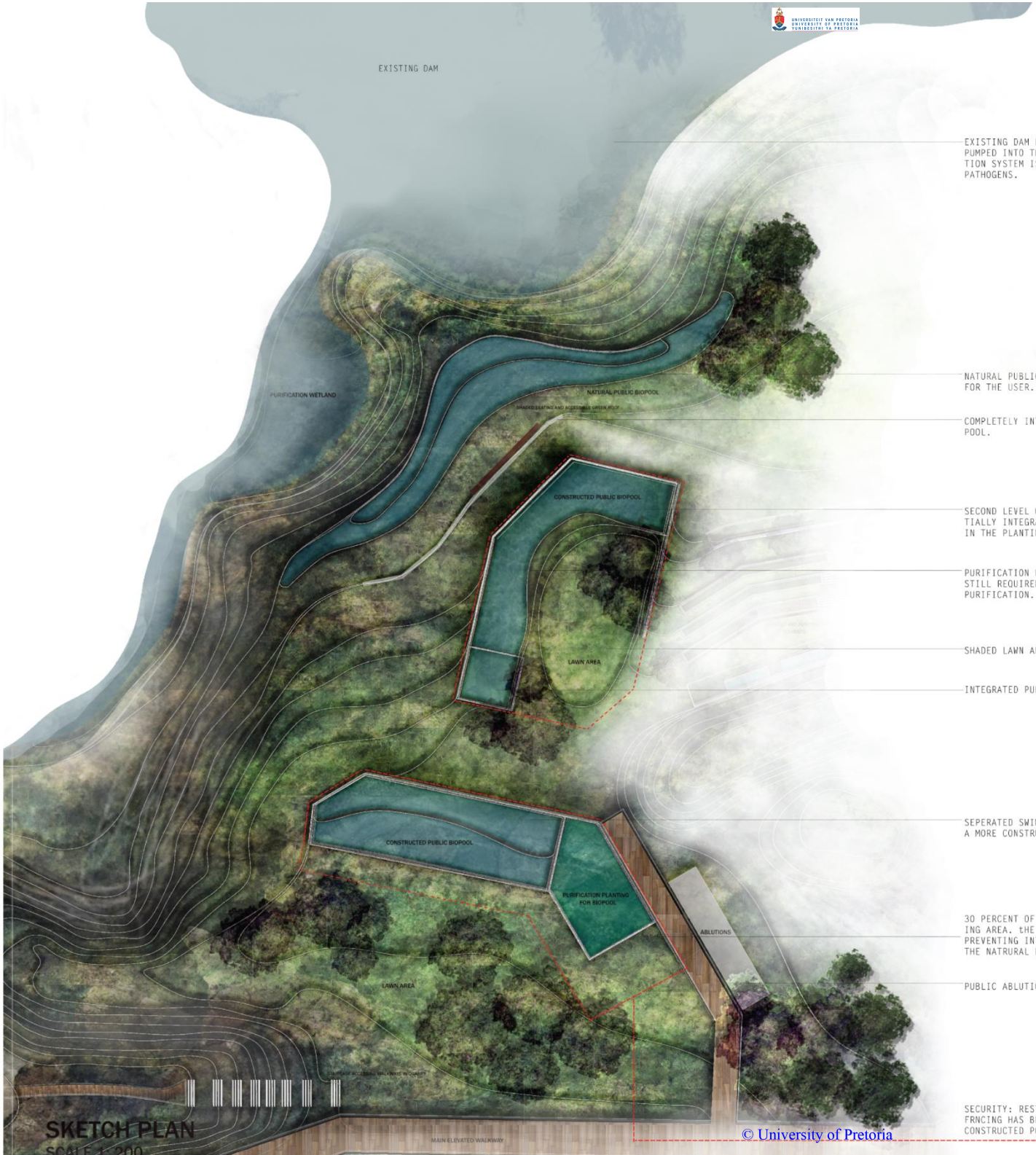
Each pool has been designed to provide a various level of immersion, a further interaction with both water systems as well as the planting and natural environments. The use of the river as a resource for the interaction and public use by users has added significant value to the river from a purely interactive and recreational point of view while the aquaponics systems add value to the river system from a productive and economic point of view. The biopools are largely responsible for the social aspect of the design.





The sections explain and indicate the intention behind the incorporation of the biopools and their integration of and connection to the social and natural environments. The response of the biopool design to the existing quarry landscape allows for the user to feel immersed in and experience the landscape. Varying degrees of immersion and experience of the natural environment reconnects man to the river and its surrounding habitats in a socially comfortable and stimulating manner.

Figure 2.6.17: Biopool experiential development(Author, 2015)



EXISTING DAM FOR THE STORAGE AND PURIFICATION OF WATER WHICH IS USED AND PUMPED INTO THE BIOPOOLS WHEN THEIR WATER LEVELS DROP. THE DAM AND PURIFICATION SYSTEM IS RESPONSIBLE FOR THE REMOVAL OF ALL FORMS OF POLLUTION EXCEPT PATHOGENS.

NATURAL PUBLIC BIOPOOL. THIRD LEVEL OF IMMERSION IN THE NATURAL ENVIRONMENT FOR THE USER.

COMPLETELY INTEGRATED PURIFICATION PLANTING WITH THE SWIMMING AREA OF THE POOL.

SECOND LEVEL OF IMMERSION CONSTRUCTED BIOPOOL. PURIFICATION PLANTING IS PARTIALLY INTEGRATED INTO THE SWIMMING AREA, PEOPLE ARE ABLE TO INTERACT AND MOVE IN THE PLANTING AREA.

PURIFICATION PLANTING. MORE NATURAL AND INTERACTIVE THAN THE FIRST BIOPOOL. STILL REQUIRED 30 PERCENT OF AREA IS CONVERED BY PLANTING FOR THE APPROPRIATE PURIFICATION.

SHADED LAWN AREA

INTEGRATED PURIFICATION PLANTING

SEPERATED SWIMMING AREA OF BIOPOOL. NO PLANTING IS INTEGRATED IN TO THE AREA, A MORE CONSTRUCTED AND UNNATURAL FEEL TO THE POOL.

30 PERCENT OF AREA OF WATER THAT REQUIRES PURIFICATION IS THE REQUIRED PLANTING AREA. tHE PLANTING AREA IS COMPLETELY SEPERATED FORM THE SWIMMING AREA, PREVENTING INTERACTION BETWEEN USER AND NATURAL ENVIRONMENT. NO IMMERSION IN THE NATRURAL ENVIRONMENT YET STILL USES NATURAL SYSTEMS FOR FUNCTION.

PUBLIC ABLUTIONS

SECURITY: RESTRICTED ACCESS TO PUBLIC BIOPOOLS. FRNCING HAS BEEN INCORPORATED AROUND EACH OF THE CONSTRUCTED POOLS

Figure 2.6.18: Biopool explanation. (Author, 2015)

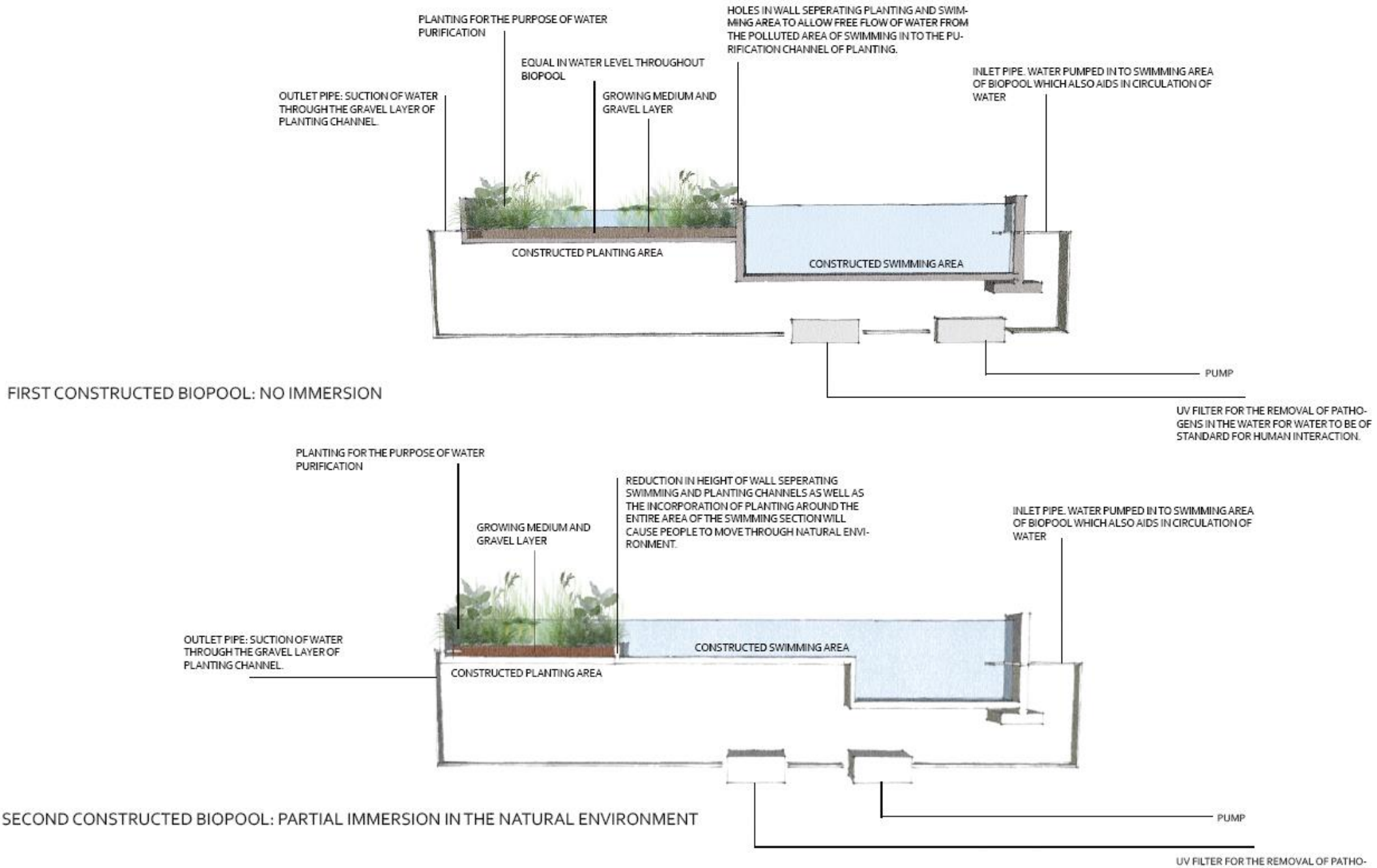
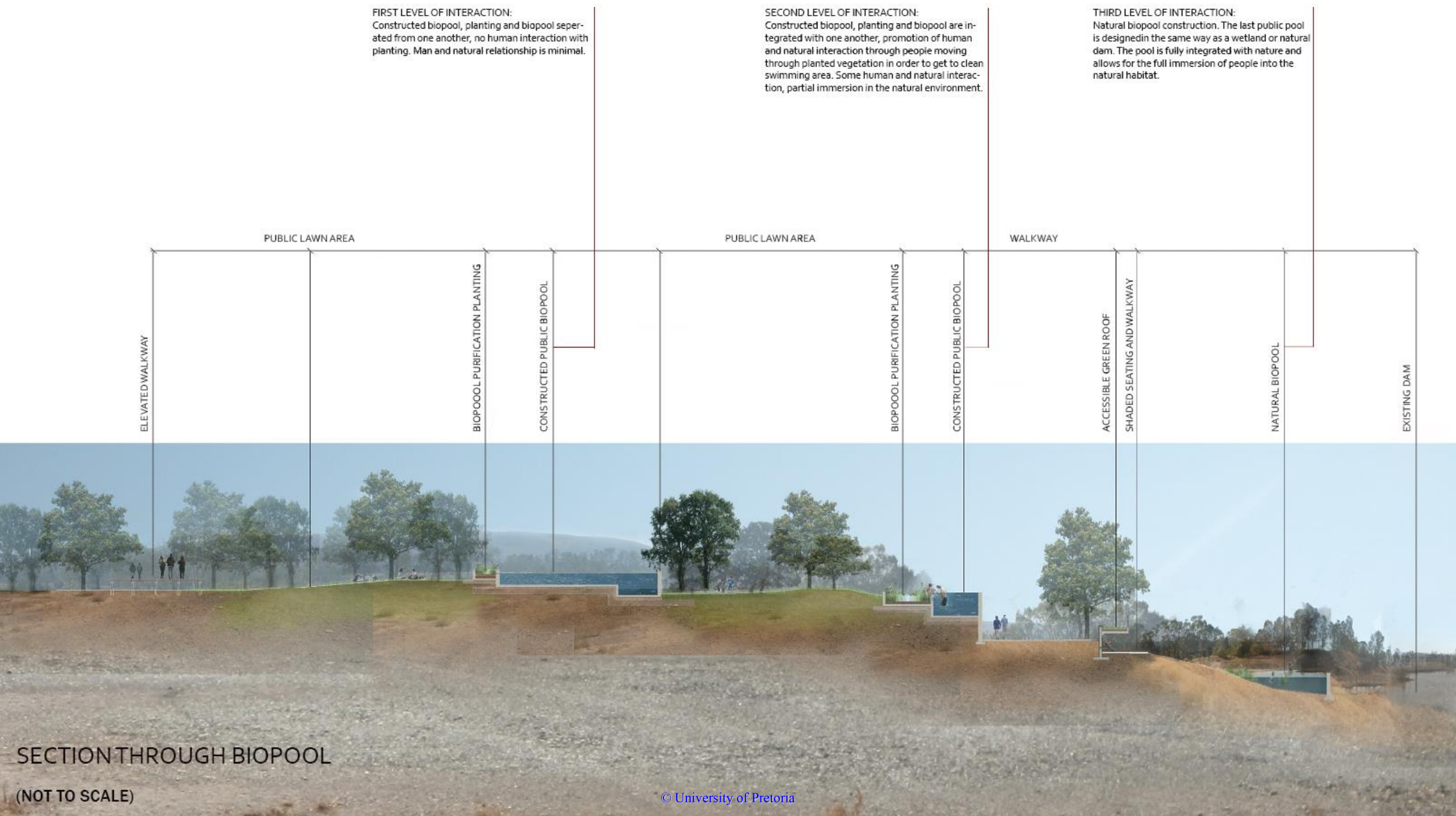


Figure 2.6.19: Explanation of various Biopool construction approaches(Author, 2015)

Figure 2.6.12: Section through Biopools
(Author, 2015)



BIOPOOL 3

BIOPOOL 2

BIOPOOL 1