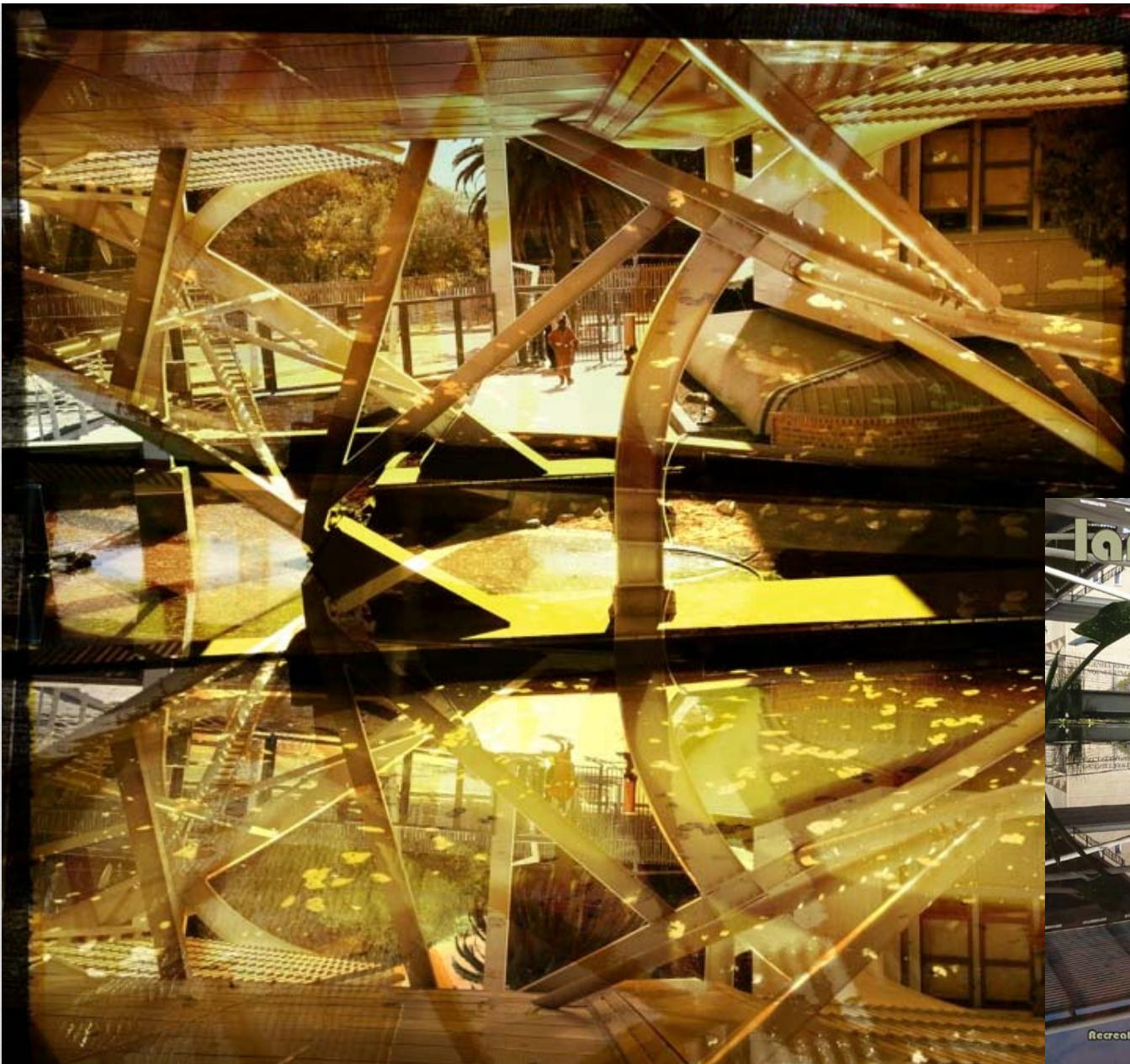


A photograph of a rainwater harvesting garden. The foreground shows several clumps of tall, green, blade-like plants (likely reeds or sedges) growing in shallow, murky water. The background is a large, calm body of water reflecting the sky. The overall scene is a naturalistic water feature.

Rainwater Harvesting Garden at the University of Pretoria

Construction,
planting and proofing.

Neal Dunstan: University of Pretoria, Facilities Management Landscape Architect
Jason Sampson: University of Pretoria, Curator Manie van der Schijff Botanical Garden



JAN/FEB 2014

FOOTPRINT

limited



Conservation, rehabilitation and recycling



Background

- project is an example of the piece of the 'campus' puzzle
- define 'campus'
 - the whole grounds (landscaped) including buildings
 - derived from Latin meaning 'field'

Background

- “In our own times these pleasant grounds are designed as a concourse or place of meeting for students, their friends and teachers, where they are enabled to assemble in friendly exchange. It is here, that, among his equals, he achieves a natural discipline of mind and conduct. It is here, where the unwritten laws of the campus prevail, that its influences shape the character of the callow student, presenting to his teachers malleable and educable material who with devotion, dedication, and some patience, complete the process of conversion into the earnest scholar.”

· Chancellor of the University of Pretoria, Adv Charles te Water, introducing the Governor-General, at the opening of the Aula, 6 September 1958

Orientation



<http://repository.up.ac.za/handle/2263/6523>

A decorative illustration of a water lily with a green stem and leaves, and a white flower with a yellow center, positioned in the top left corner of the slide.

HISTORY

- Need for a study centre for the Engineering Faculty was identified as part of the Engineering 3 project (2009-2012) but, lack of sufficient funding did not allow for this.
- In 2011, Exxaro donated funds for the project to be constructed
- Professional team same as Engineering 3 project
- First team meeting late November 2011, SDP submission early December 2011, tender documents early February 2012
- Design refinement most of 2012

Design Considerations

- Faculties of Engineering, Built Environment and IT, and Natural and Agricultural Sciences
- Project falls within the Manie van der Schijff Botanical Garden; legal obligation to maintain and develop an internationally recognized botanical garden
- Conversion of road from a hard, impervious surface to a mixed pervious surface; from mid 1940's
- Space used by blind students
- Large roof structure 1700m²



Design Considerations

- Space to be used by more students thus circulation and seating critical
- Space was severely degraded due to neglect, disuse and construction works
- Storm water identified as a constraint due to overused and frail infrastructure
- Lecture facilities not waterproofed
- Maintain symmetry





Green Star Rating

- Green Star rating exercise for pilot project, as rating system for Public and Educational Institutions
- Landscape design would have accounted for nearly 35% of total points for 4 star rating
- 5 star rating, landscape could account for nearly 47% of total points, mainly by a green roof



Opportunities

- Existing trees already create character
- Stormwater and geology allow for water collection, storage, cleaning and re-use
- Landscape to complement and showcase the 'progressive' direction of the various professions



Opportunities



- Lower capital and operational costs in comparison with conventional drainage systems
- Utilising a 'free' resource as an asset and not as a waste by-product
- Research and living laboratory (ISCN Conference 2013)

Constraints



- Always playing catch-up
- Natural water cycles are being short-circuited
- Natural infiltration limited due to lack of water proofing on building
- Level changes and narrow walkways, especially for disabled students

Constraints

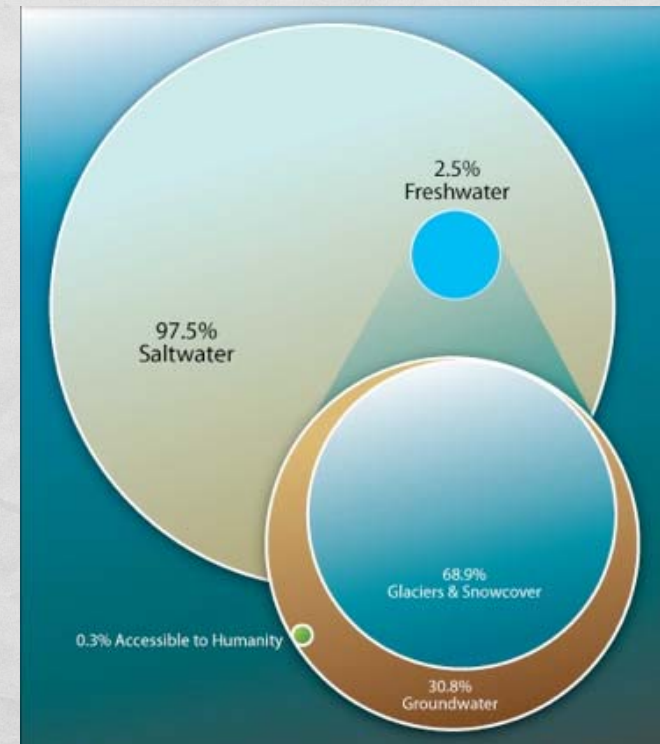


- Spaghetti of services
- Poor soil conditions due to 60+ years impervious surfaces/biological activity/acidification of soil
- Education and misconceptions with regards to natural systems/paradigm shift

Stormwater

- Only 2,5% of the world's water is freshwater, and even less is readily accessible to people (0,3%).

- www.sherwoodinstitute.org



Sustainable Landscapes/Sites



- “Sustainable landscapes are often discussed purely in terms of environmental sustainability, but to be truly sustainable (i.e. lasting into the future without needing high inputs of resources and energy to maintain them) they must also be acceptable to the people who use them on a daily basis.”
- “It is essential to always look upon ecologically-informed landscapes as being multi-functional and delivering multiple benefits, rather than becoming fixated on single issues - if one takes the narrow approach then so much wider potential is lost.”



Rain Garden (Bioretention Cell)

- A rain garden (bioretention cell), is an engineered combination of specially selected plants, soils and mulch designed to collect, retain and cleanse rainwater that runs off impervious surfaces such as parking lots and rooftops. Unlike traditional curbs and storm drains that quickly move stormwater off site, new practices, such as rain gardens, slow down stormwater so it can percolate into the soil, naturally filtering pollutants and recharging the groundwater.

• *Adopted from the University of Maryland Arboretum and Botanic Garden (<http://www.arboretum.umd.edu/discover/rainGarden.html>)*

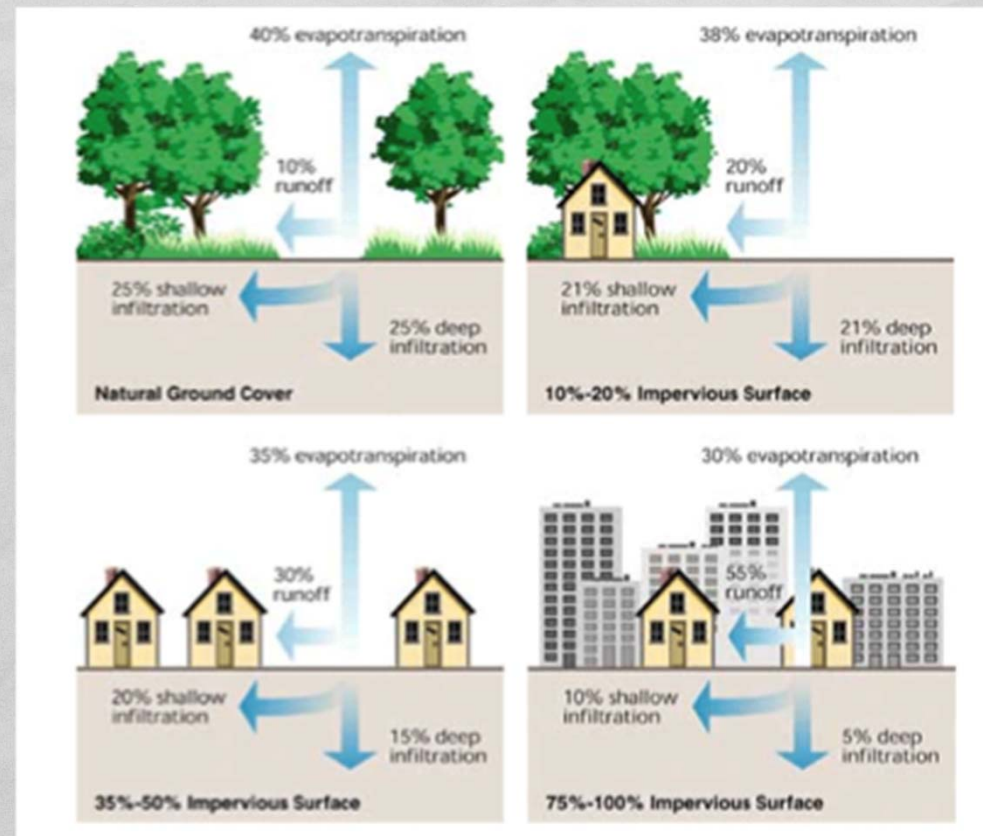


Advantages of a Rain Garden

- Environmental benefits - habitat for wildlife, reduced energy use and pollution, microclimate
- Sense of place and distinctiveness
- Built surroundings become more visually stimulating and dynamic
- Environmental stewardship and pride promoted
- Maintenance requirements reduced



hydrological cycle

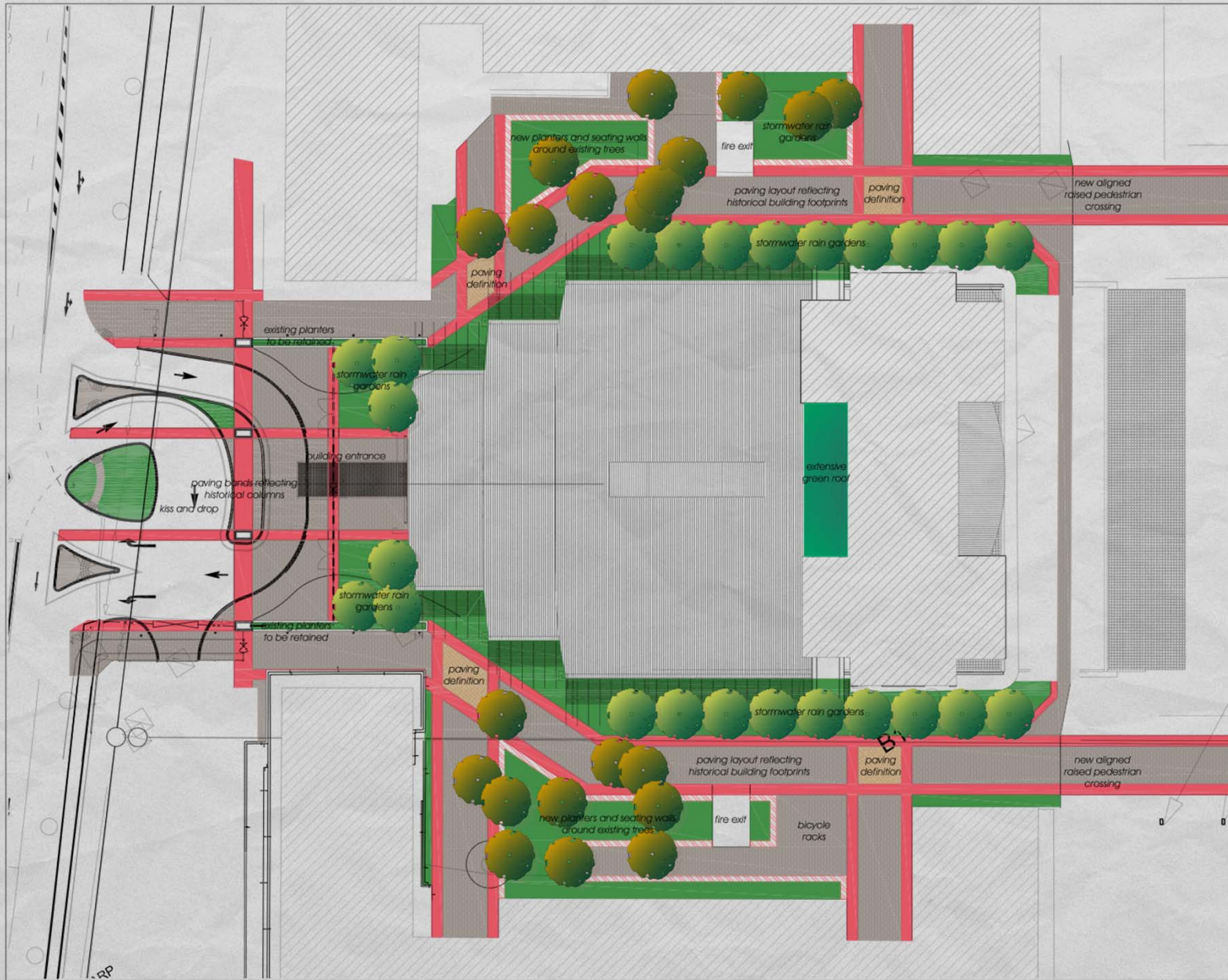


site





sketch plans 2011-2013



LEGEND

- extensive green roof
- paving 50mm red clay paver bands min 25mPa
- paving building entrance definition for universal access
- paving 50mm grey block paving min 25mPa
- planting consisting of groundcovers (min 60m²) and shrubs (min 14m²)
- seating walls 450mm high
- new min 100l trees
- existing trees to be retained

REVISION RECORD:

NO	DATE	DESCRIPTION

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All drawings and dimensions on this drawing have been taken from the latest drawings and specifications. Any discrepancies are brought to the attention of the contractor before construction.

LOCALITY PLAN

CLIENT
UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
TUMIBESITHI YA PRETORIA

PROJECT
PROPOSED NEW ENGINEERING STUDY CENTRE

DRAWING TITLE
SITE DEVELOPMENT PLAN

DESIGN	APPROVED	ISSUE
reqd	reqd	SDP submission
SCALE	DATE	PLANT DATE
1:250 @ A2	12 Dec 2011	12 Dec 2012
PROJECT #	DRAWING #	REV #
UP2012001	LA 000	00

site construction







tank

- 130m³ tank collecting overflow from all 4 ponds and swales
- Concrete structure integrated into staircase
- Total pond maximum capacity ±550m³
- ±325m³ permanent ponds, ±180m³ tidal ponds, ±45m³ swales

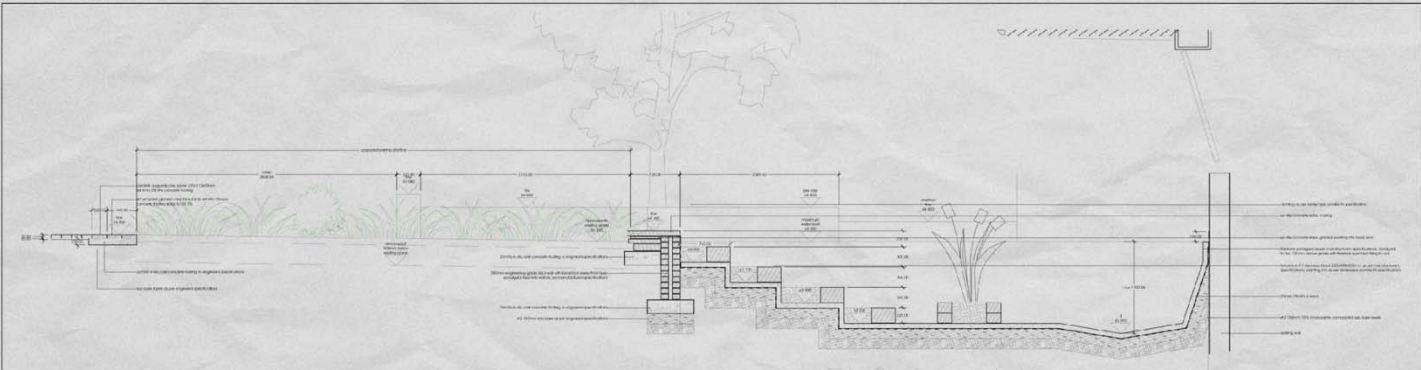




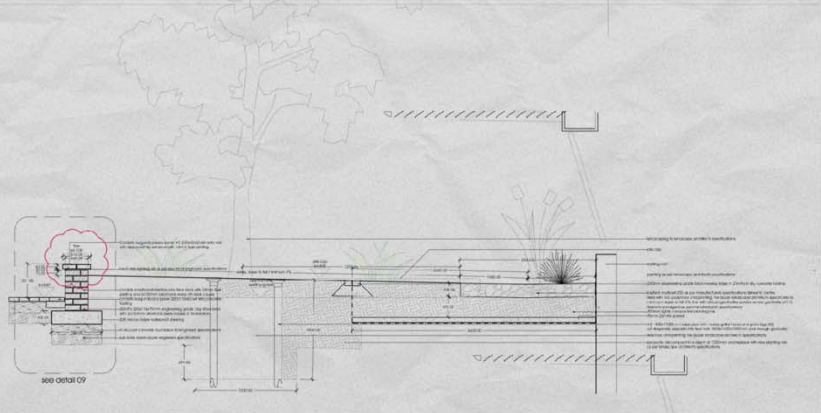


liner

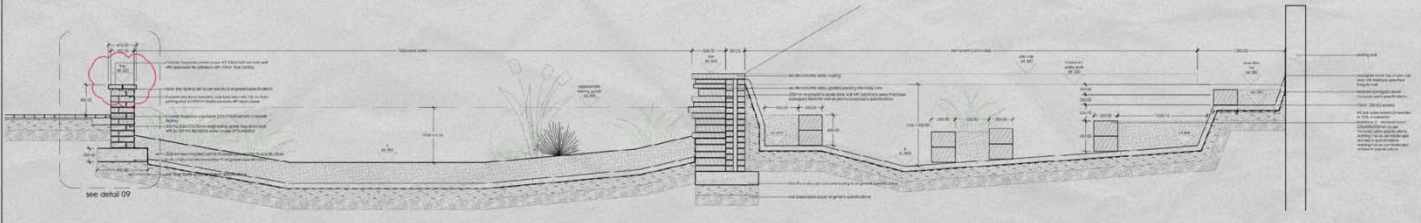
- Firestone Pond Gard and Carlisle Rubber Liner
- Rubber liner with 60% carbon black
- Bonding is cold vulcanisation
- Firestone Technical Director
- Waterproof membrane for roofs



section dd: variable pond and permanent pond with gully entry
scale 1:20



section ca
scale 1:20

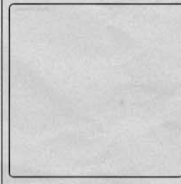


section ab: variable pond and permanent pond with searing wall
scale 1:20

1:20

NO.	REVISION
01	ISSUED FOR TENDER
02	ISSUED FOR CONSTRUCTION
03	ISSUED FOR AS-BUILT

The details shown on this drawing are to be used for the construction of the project. The contractor is responsible for ensuring that the construction is in accordance with the specifications and standards of the relevant authorities.



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

PROPOSED NEW ENGINEERING STUDY CENTRE
HATFIELD CAMPUS

SECTIONS 01
PHASE 1

NO.	DATE	BY	FOR
01	14 Feb 2013	LA	CONSTRUCTION
02	14 Feb 2013	LA	CONSTRUCTION





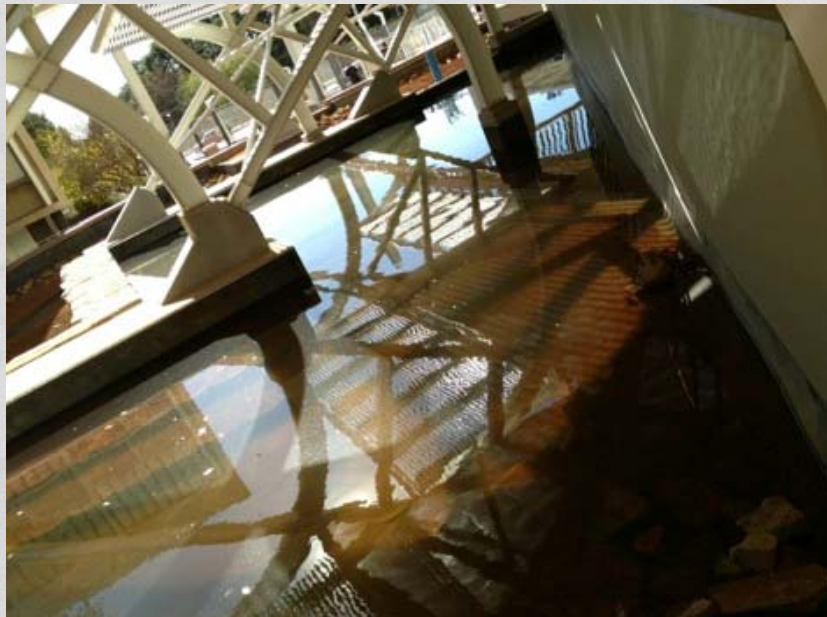




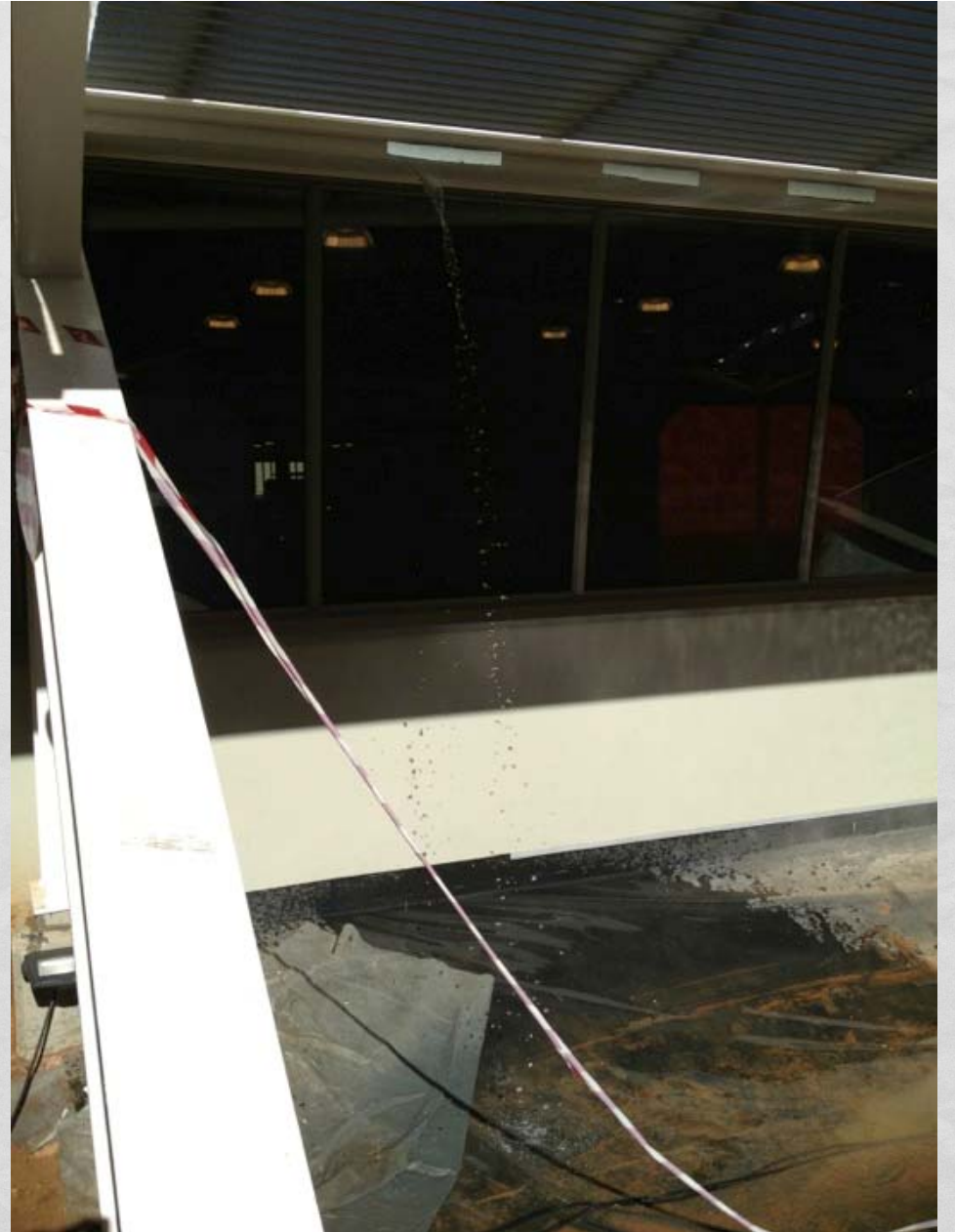














Recycling

- Specially manufactured grooved bricks reused in paving
- New paver blocks manufactured from platinum mine waste
- Concrete paving recycled as cladding
- Copings reused as stepping stones
- Soil from Prinshof Lecture Complex
- Compost from UP compost project
- Excavated rocks





paving

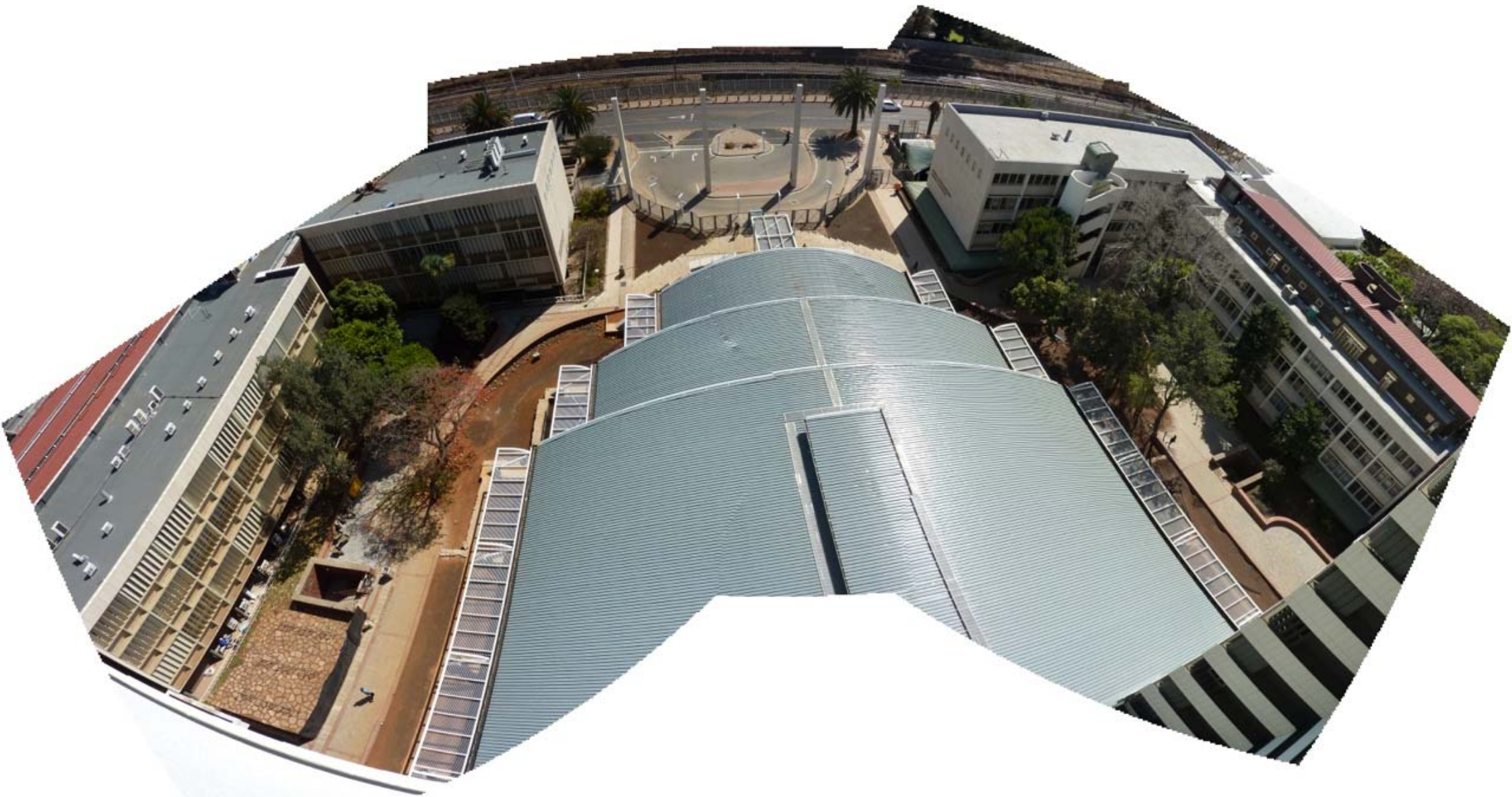




lighting

- Day-night cycles of plants
- Not to interfere with with research of fish, frogs, etc
- Subtle lighting of walkways (wash lighting)
- No pole tops instead LED lighting integrated into seating walls
- Attempt to adhere to 'dark sky' principles





Savings

- Stormwater infrastructure upgrade: ±R3,5-4million
- Waterproofing of lecture halls: ±R4-R4,5 million
- Total: ±R7,5-8,5 million
- Landscape solved both problems: R1,6 million
- Botanical Garden irrigation primarily from stormwater in season
- UP Water: water quality in tank better than tap water



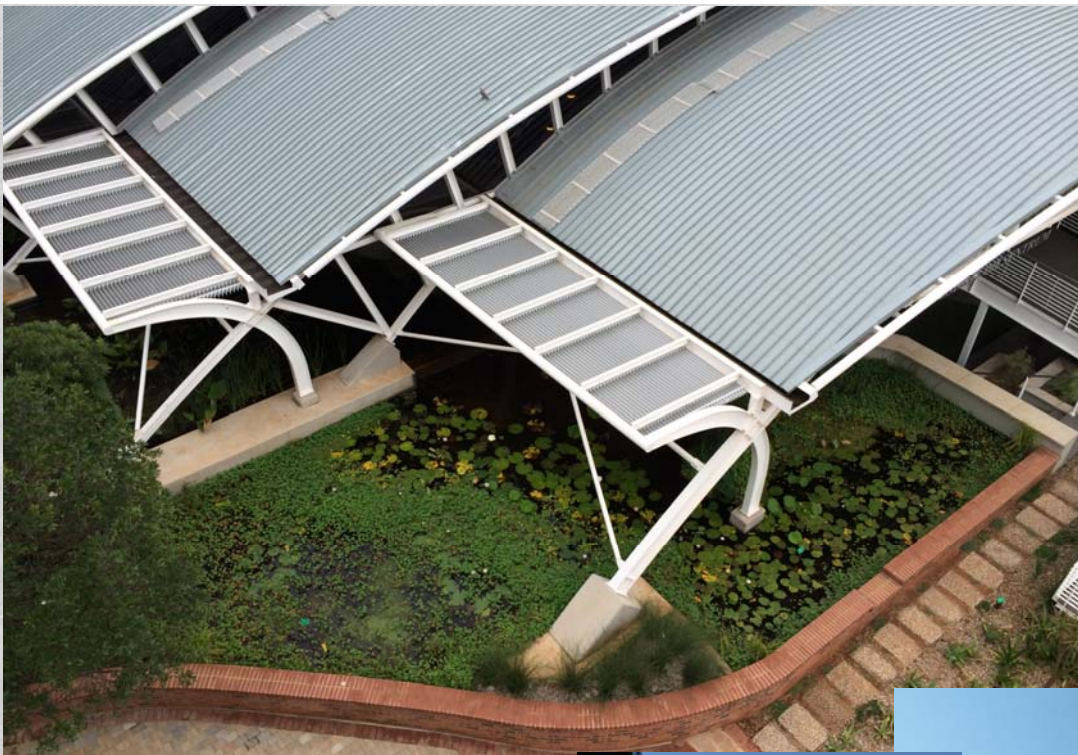


Significance

- Developing and evolving landscape/living laboratory (ISCN)
- 5 zoology research students
- To be published in local journals
- Global Change Grant - Prof Chrisna du Plessis
- Signage, QR codes and weather station

Results





The team is getting really excited now...



**UNIVERSITY OF PRETORIA STUDY CENTRE RAIN GARDEN
SPRING 2013**