LNA 458 PENNY LODGE

STORMWATER MANAGEMENT REPORT

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LINDA NESS ASSOCIATES
CONSULTING ENGINEERS

7-10 Bonville Park, 56 Armstrong Avenue, La Lucia, Durban, 4056
P.O. Box 900, Hyper By The Sea, Durban, 4053

Tel 031 572 4153
Cell 082 808 0695
Email : linda@nessconsulting.co.za
www.nessconsulting.co.za

2. GENERAL PROJECT INFORMATION

The site is located in the Zululand Rhino Reserve, on the northern bank overlooking the Msunduzi River. The Lodge cluster is arranged along an outside bend of the river, some 8-10m above the river bed. The far side of the river forms the lower floodplain.

2.1 Topography

The site for the lodge cluster is fairly flat, and the buildings are to be positioned back from the top of the river bank in accordance with the requirements of the Geotechnical Engineers recommendations and the environmental requirements.

2.2 Geology and soil conditions

A Geotechnical Engineering investigation has been carried out by Drennan Maud (Pty) Ltd, dated 18 March 2016.

There is generally overlying alluvial and residual material occurring on the site and excavation is expected to be easy. These materials may be unstable and side wall collapse should be expected when excavating foundations.

Founding of the structures on shallow strip footings or column base foundations is likely to be possible. Both strip footings and column base footings will be taken into the stiff/dense subsoils that are likely to be either alluvial or residual basaltic soils, taken to a minimum depth of 1.2 m below the current ground level.

2.3 Ground Water

No groundwater is likely to occur where the lodge cluster site is proposed. However, during periods of high rainfall groundwater seepage may occur at the contact between the colluvial soils and the residual soils and underlying weathered bedrock.

3.1 General Description of the Building Structures

The concept of the naked building structures can be described as a series of structural steel beam grillages, supported off either timber or steel columns, and braced utilising the timber stud/clad wall systems as structural shear walls.

Columns and shear walls will be connected onto concrete plinths and stub columns off the foundations.

As such the structures can be loosely described as composite steel and timber modularised frames.

Roofs will generally be sheeted with lightweight steel profiled roof sheeting.

Fenestration and sliding/folding glazed screens will be co-ordinated to be supported within the structural modularisation methodology.

The following features outline the intended design development outcomes:

- Steel and timber above ground, Concrete at and below ground
- “ Touch the earth lightly”
- Utilise the timber clad walls which are themselves robust elements, as structural features to brace the buildings.
- Modularise a flat steel beam grillage to incorporate lines of fenestration in any direction and to support the sheeting rails.

- "Tipped" roof planes to support sheeting will be created by lifting the sheeting rail plane off the grillage
- Connection typologies will be developed with the Architect to create an aesthetic to the structural connections that allows adequate load transfer at all of the interfaces.

3.6 Storm Water

The design intent is to create landscaping commensurate with the existing bushland and there is no intention to create berms or other such natural features which would change the natural stormwater runoff in open areas.

Timber decks are intended to be open jointed such that the rainwater runoff simply drains onto the ground below and drains away naturally or percolates into the ground.

Stormwater management is therefore limited to:

- The water draining off the roof structures. There are no gutters on the roofs, which are monopitched towards back of house and allow a sufficient overhang from the building walls to allow for runoff from the roof to fall directly onto the ground.
- At the ground line zone strip that will be situated under the roof edge, the Architectural treatment will be such that the landscaping can accept this runoff without degradation or erosion and the rainwater will be allowed to fall away from the building without concentration into the natural soils surrounding the lodge complex

- Any areas that require concentrated collection of stormwater as a result of design development, or for example, pool backwashing procedures, will be drained with a below ground piped system which will terminate at the adjacent existing dam where it will be discharged through a headwall system complete with flow reducing splitter blocks and reno mattresses, given the very small additional stormwater attenuation volumes required, no work to the existing dam is envisaged.

By developing the site, the 10 and 50-year run-offs increase by 24%. Calculations were carried out based on the rational design (Guidelines and policy for the Design of Stormwater Drainage and Stormwater Management Systems).

In accordance with local municipality's requirements, the predevelopment flows were calculated using greenfield coefficients. The pre and post development 50-year storm return period are used to determine the volume run-off to be retained (temporarily) on site while discharge from the site will be limited to the 10 year pre-development return period. The time of concentration is used as the storm duration.

Summary of 1:10 and 1:50 attenuation requirements

Flood return period	Pre development flow ($Q=m^3/s$)	Post development flow ($Q=m^3/s$)	Attenuation required (m^3)
1:10	0.006	0.014	9
1:50	0.010	0.024	15

3.7 Drainage Zones

The table below gives a comparison between the design stormwater discharge for pre- and post-development for 10 and 50year storm events. Also shown are the design volumes required for attenuation. The increase factor applies to both storm periods.

PENNY LODGE

10 YEAR STORM

Stormwater Calculations

	Bulk Zones Calcs		**Current Status**			
			Area 1			
			Area	**%**		
Total Area	A		608		**m2**	
Design return			10		years	
Useage	Garden	0.35	608	100%		
	Total Area		**608**	**100%**		
Time entry	Te		15		min	CED Manual May 2008 item 1.2
Coefficient			0.35			Average of useage
Intensity	I		101		mm/hr	Rainfall Data (CED Web Site
Run-off	**Q**		**0.006**		**m3/s**	Q=cia

Stormwater	**Bulk Zones Calcs**		**Future Status**			
			Area 1			
			Area	**%**		
Total Area	A		608		**m2**	
Design return			10		years	
Useage	Remaining Garden	0.35	0	0%		
	Proposed Hardened	0.85	608	100%		
	Total Area		**608**	**100%**		
Time entry	Te		15		min	CED Manual May 2008 item 1.2
Coefficient			0.85			Average of useage
Intensity	I		101		mm/hr	Rainfall Data (CED Web Site
Run-off	**Q**		**0.014**		**m3/s**	Q=cia

Increase factor			2.43			
Additional volume		vol	9		m3	(0.014-0.006)*60*(17.4)

PENNY LODGE
50 YEAR STORM

Stormwater Calculations

	Bulk Zones Calcs		**Current Status**			
			Area 1			
			Area	**%**		
Total Area	A		608		**m2**	
Design return			50		years	
Useage	Garden	0.35	2051	100%		
	Total Area		**2051**	**100%**		
Time entry	Te		15		min	CED Manual May 2008 item 1.2
Coefficient			0.35			Average of useage
Intensity	I		165		mm/hr	Rainfall Data (CED Web Site
Run-off	**Q**		**0.010**		**m3/s**	Q=cia

Stormwater	**Bulk Zones Calcs**		**Future Status**			
			Area 1			
			Area	**%**		
Total Area	A		2051		**m2**	
Design return			50		years	
Useage	Remaining Garden	0.35	0	0%		
	Proposed Hardened	0.85	608	100%		
	Total Area		**608**	**100%**		
Time entry	Te		15		min	CED Manual May 2008 item 1.2
Coefficient			0.85			Average of useage
Intensity	I		165		mm/hr	Rainfall Data (CED Web Site
Run-off	**Q**		**0.024**		**m3/s**	Q=cia

Increase factor			2.43			
Additional volume		vol	15		m3	(0.024-0.010)*60*(17.4)

CONCLUSION AND RECOMMENDATION

The retention of stormwater will be achieved by piping any concentration of discharge to the existing dam during storm occurrences.

It is proposed that any gutters and downpipes will discharge directly into the stormwater network.

Regular maintenance of the system must be carried out to ensure that blockages of the pipes do not occur. Under normal rainfall conditions, the occupants will not be adversely affected by the stormwater system.

Linda Ness Associates trusts that these proposals will enable the necessary approvals to be granted for the development.

Andrew Jamieson (Pr Tech Eng)