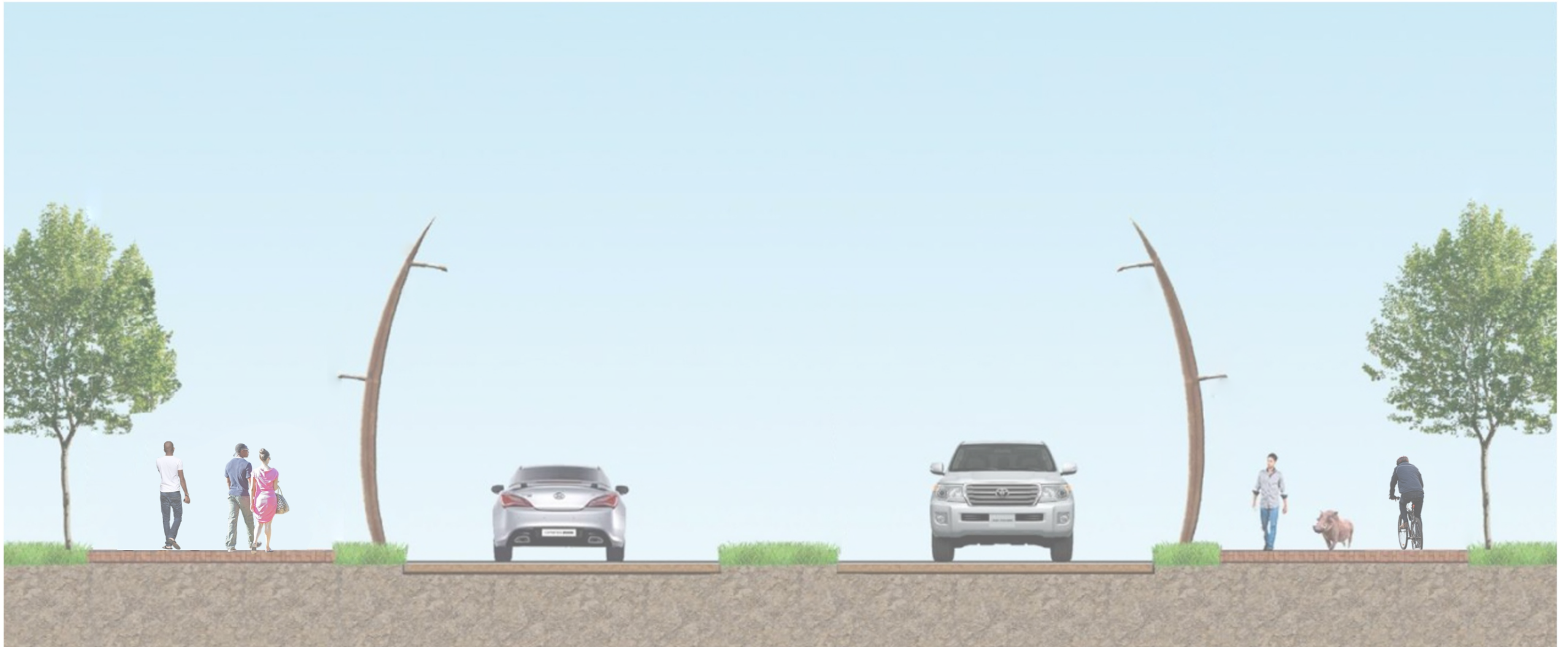


Republic of Botswana



DEVELOPMENT OF GUIDELINES AND STANDARDS FOR KASANE KAZUNGULA REDEVELOPMENT PLAN

Final Report - June 2019

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IN ASSOCIATION WITH:

MINISTRY OF LAND MANAGEMENT, WATER & SANITATION SERVICES

MINISTRY OF ENVIRONMENT, NATURAL RESOURCES CONSERVATION & TOURISM

CHOBE DISTRICT COUNCIL

DEPARTMENT OF TOWN & COUNTRY PLANNING

CHOBE LAND BOARD

BOTSWANA TOURISM ORGANISATION

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01 EXECUTIVE SUMMARY

These Urban Design guidelines are a result of Government of Botswana's strong commitment to transform Kasane Kazungula into a well planned top grade tourist destination . The Integrated Tourism Strategy for Kasane Kazungula Area (BTO, 2012) and the Kasane Kazungula Redevelopment Plan (Ministry of Land Management, Water & Sanitation Services 2015) preceded and informed preparation of these guidelines.

How to use this Manual.

The core aim of the Guidelines is to provide developers, designers and planners with the information and support they need to improve the design quality and sustainability of the development schemes with which they are involved. The Guidelines therefore seek to fulfil a number of different roles. They will need to be useful when developers are selecting a site and briefing their design team; in helping to frame design statements and planning applications; and in helping planning authorities to assess the quality of submitted planning applications.

The Guidelines provide best practice advice on the practical implementation of the policies contained in the Kasane Kazungula Redevelopment Plan. Using both real and illustrative examples, the document focuses on creating well designed sustainable neighbourhoods with strong sustainability principles.

The examples shown as illustrations are by no means the only solutions possible or an exhaustive list - there are a number of ways of dealing with any issue, depending on circumstances. Planners and architects will make professional interpretation of the principles and urban design intent in these guidelines and respond accordingly.

presents a set of minimum compulsory green design standards that have to be fulfilled by all developers. It goes further to develop voluntary green design guidelines to guide developers that wish to

further the green design agenda.

Structure of this document

Chapter **One** is the executive Summary that highlights the synopsis of the whole project and what it seeks to achieve.

Chapters **Two** and **Three** are Background and Vision respectively. They present the strong sustainability planning and ecotourism philosophy that informed this current outcome of the Guidelines.

Chapter **Four** discusses the Urban Design principles that informed the conceptualisation and development of spatial organisation and design.

General Guidelines including Environmental Design guidelines are discussed in chapter **Five** of this document. The Environmental design guidelines are structured as *General, Mandatory and Voluntary Standards*.

This Guidelines manual is structured around the three levels that form the hierarchical urban design interventions of the Kasane Kazungula area. These three levels are; 1) *General*- the whole

Kasane Kazungula Redevelopment plan study area; 2) *Supplemental*- the specific precincts and sites identified in Kasane and Kazungula ; 3) *Implementation*- which include site plan and design review process.

Specific Guidelines for Kasane and Kazungula are discussed in chapters **Six** and **Seven** respectively. Chapter **Eight** outlines the Design palette that shall form the basis for texture and colour to be applied in the construction of urban fixtures such as buildings and landscape elements. The last chapter, presents the Design review process and stages to enforce efficient implementation of these guidelines.

02

BACKGROUND AND PURPOSE OF GUIDELINES

•BACKGROUND

•PURPOSE



Kasane Study Area Boundary



Kazungula Study Area Boundary

Background

The development of these guidelines and standards for Kasane Kazungula Redevelopment Plan is a component of Botswana Economic Advisory Council's strategy to develop the infrastructure in the study area and strategically position Kasane/Kazungula within the Kavango Zambezi Transfrontier Conservation Area (KAZA) tourism region in order to derive maximum benefit in Tourism. The Integrated Tourism Strategy for Kasane Kazungula Area (BTO, 2012) and the Kasane Kazungula Redevelopment Plan (Ministry of Land Management, Water & Sanitation Services, 2015) preceded and informed the current phase.

The Kasane Kazungula Redevelopment Plan identified key development Precincts and Projects in the study area that require Urban Design intervention to transform them into the highest standards envisioned by the Integrated Tourism Strategy for Kasane Kazungula. This project therefore interpreted the findings of both the Integrated Tourism Strategy and Redevelopment Plan and applied Urban Design strategies to bring them into reality through designs and actionable Standards and Guidelines.

Preceding this stage, was the Preliminary Design Report whose objective was to build a strong foundation on which to base the designs and urban design guidelines.

Through an interactive participatory process with key stakeholders, the study area was assessed and analyzed; objectives interrogated and together developed a common vision that continues to guide the development of these urban design guidelines.

Purpose

The primary purpose of these guidelines is to establish urban design standards for Kasane and Kazungula through development review process and for select identified public realm improvement projects with the aim to attain the vision of transforming the study area into a top grade tourism destination.

These urban design guidelines seek to attain the following:

Provide more effective and design focused guidelines for select areas in Kasane and Kazungula and for specific types of development that require greater attention;

Establish design priorities and criteria in certain select areas;

Facilitate a more coordinated and integrated Site Plan review and approval process;

Promote urban design awareness and education, and;

Promote creativity and innovation

The Guidelines provide a contemporary (design-based) approach to development review and approvals. The guidelines are multipurpose by nature and have been prepared for a specific set of users and audiences that include:

Chobe District Council – The guidelines articulate the Council's design aspirations for site development across the study area.

Developers – The primary users of these urban design guidelines are the development industry professionals including developers, consultants and Council staff.

Other Stakeholder Authorities – The urban design guidelines will also provide direction to other stakeholder institutions whose mandate impact on land use and development within the study area. These include committee processes and clearances for developments within the study area.

03 VISION AND PHILOSOPHY

The establishment of a Vision that informs the development of these guidelines was extensively articulated at the Preliminary Design report stage. In summary, the concept of eco-tourism was unpacked as the driving force behind the vision for the development of Urban Design Guidelines for Kasane/ Kazungula Redevelopment Plan.

The definition of Eco-tourism adopted, acknowledges that conservation of natural resources is important as it also has an impact on the ability of a tourist town to generate income from economic opportunities which in turn contribute to the development of the town and well-being of the local people.

Using eco-tourism as the base for vision development, there are key themes that form the main components of the vision. These are: Ecology and Conservation, Capitalising on the river, Contemporary African Town, Community at the heart and Global positioning.

Each of the key themes have specific strategies that help realise the vision. The strategies are tangible programs that can be realised through specific projects.

The current Urban Design Guidelines presented in this report are part of the strategies employed to realise the broader vision adopted for this project.



Eco-tourism graphic (Iyer, 2015)



04

PRINCIPLES OF SPATIAL ORGANISATION

- a) Connections
- b) Inclusivity
- c) Variety
- d) Efficiency
- e) Distinctiveness (Sense of place)
- f) Layout
- g) Public Realm

a) Connections

How well connected are the different precincts in the study area? Successful neighbourhoods tend to be well connected to places, facilities and amenities that help to support a good quality of life. Such places include high quality open space and landscapes, leisure opportunities, shops – both for convenience and comparison goods, schools, places of worship, health centres and places of employment. The conceptualisation of precinct identification and development in Kasane and Kazungula was particularly tailored to answer this question.

The attractiveness of the scheme to cyclists/pedestrians; location of mixed uses along main corridor have all contributed to a place with strong connections.

b) Inclusivity

The ease with which the community can use and access the proposed areas is a fundamental planning principle. One of the key assignments for this project was to ensure that the local community have access to the natural resources (Chobe river). The new layout will enable easy seamless access by all to some of the best areas meant for ultimate social leisure comfort. The proposed scheme has a range of public, communal and/or private amenity spaces and facilities for children of different ages, parents and the elderly for both local and tourists.

Some of the proposed areas along the Chobe river will activate human interaction with the river and the new buildings present a positive aspect to passers by avoiding unnecessary physical and visual barriers.

c) Variety

This project aims to bring diversity and character to quality of life in Kasane and Kazungula, to not only improve quality of life for the locals but to ensure that tourists can have a pleasant stay in Kasane after the wildlife experience which is a big pull factor in the study area. Proposed activities generated by the development and the manner in which they are structured will contribute immensely to the quality of life.

Uses that attract the most people such as the Riverfront precinct in Kasane are in the most accessible places. The new scheme has ensured that in the endeavour to provide variety and diversity of offerings, opportunities have been taken to provide shops, facilities and services that complement those already available in the neighbourhood such as existing malls and offices.

d) Efficiency

Appropriate utilisation of resources is key to ensure that the proposed scheme functions and performs optimally in terms of Urban management and Environmental point of view. In this light, these guidelines have a strong emphasis on environmental design as a key component of Urban Design. Topics that range from biodiversity in Urban Design, protecting buildings from weather elements, sustainability in using land and materials, waste management etc. are thoroughly addressed by these guidelines.

e) Distinctiveness (Sense of place)

The new precincts created in this proposed scheme have been designed to have recognisable features so that people can relate and form an emotional

attachment to the place. In that way the scheme will be a positive addition to the identity of the locality. From the proposed Kazungula Junction precinct, Kasane Kgaphamadi area, and Kasane Riverfront precinct, there is a discernible focal point to the scheme that enhances the sense of place to the users.

f) Layout

How does the proposed scheme create people friendly streets and places? The proposed scheme has improved the layout of various precincts by aligning routes with desire lines to create a permeable interconnected series of routes that are easy and logical to navigate around.

In Kasane in particular, the layout focuses activity on the streets by creating active frontages with front doors directly serving the street. This is more evident at the Kasane Riverfront precinct and Kgaphamadi precinct where buildings define the street edge and have intimate relationship with the activity street on President Avenue.

Throughout Kasane under the new scheme, President Avenue street is designed as a place instead of a road for cars, helping to create a hierarchy of space with less busy routes having surfaces shared by pedestrians, cyclists and drivers. Traffic speeds are controlled by design and layout rather than by speed humps. Block layout such as new Kgaphamadi scheme places some public spaces in front of building lines as squares or greens, and some semi private space to the back as communal courts.

g) Public Realm

Safety, security and enjoyment of public spaces is a core principle in Urban place making. The proposed scheme in Kasane has a strong element of public parks, urban squares and pathways that are all interlinked and are most importantly framed by public buildings and active spaces to promote safety and security. The main park in Kasane is overlooked by the Riverfront precinct and the row of lodges along Chobe river.

The entire fabric of the public realm was considered as a usable integrated element in the design of the urban design scheme. In Kasane, roads and parking areas are considered as an integral landscaped element in the design of the public realm. Streets are treated as 'shared spaces' where a space can be parking during the day and flea market in the evening, pedestrians and cars share the space with cars not dominating.

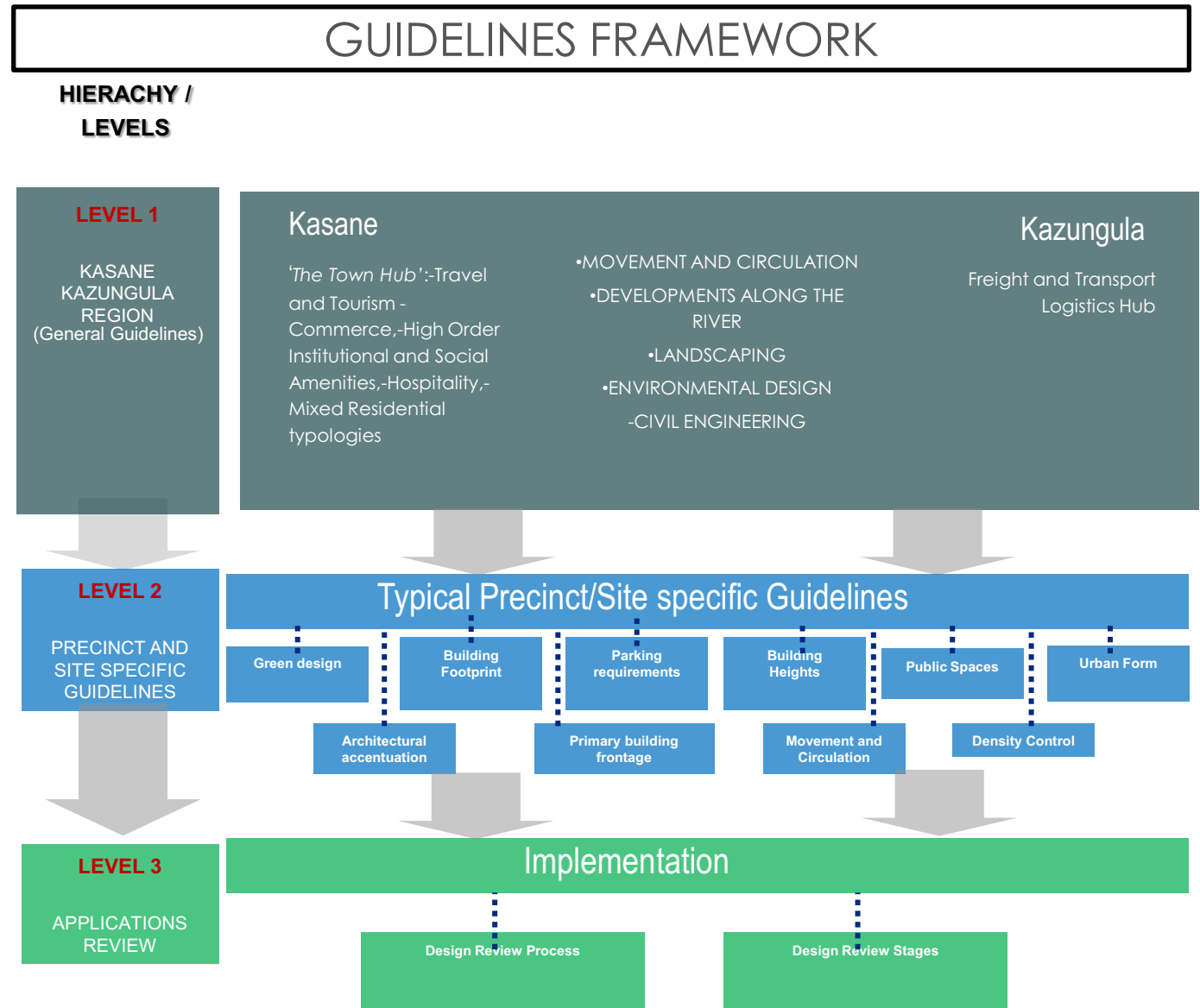
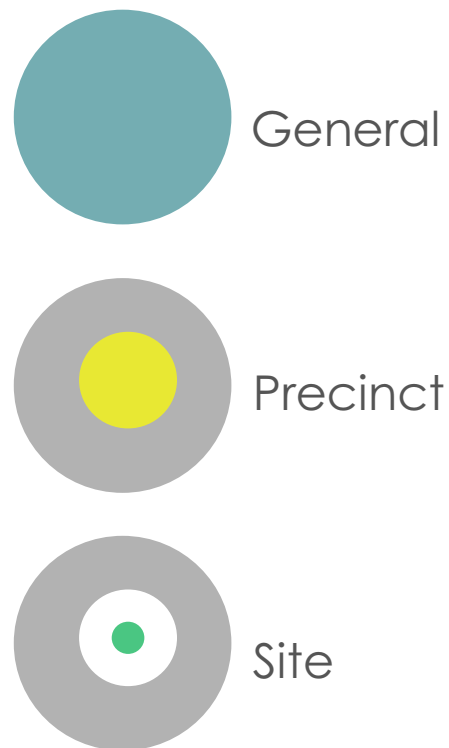
05

DEVELOPMENT GUIDELINES

5.1 GENERAL GUIDELINES

5.2 KASANE GUIDELINES

5.3 KAZUNGULA GUIDELINES



Typical Precinct/Site specific Guidelines

Green design

Building Footprint

Parking requirements

Building Heights

Public Spaces

Urban Form

Architectural accentuation

Primary building frontage

Movement and Circulation

Density Control

LEVEL 3

APPLICATIONS REVIEW

Implementation

Design Review Process

Design Review Stages

5.1 GENERAL GUIDELINES

The General Design Guidelines apply to the entire project area and may be further expanded upon at the level of Supplemental Design Guidelines. The purpose of these general guidelines is to outline the overarching urban design priorities for site development and public spaces in Kasane and Kazungula.

The general guidelines provide the philosophical framework upon which all site development guidelines will be based. Based on the adopted vision particularly as it relates to 'sustainability and green design', this section outlines minimum guidelines to be applicable to the entire study area. Key components of these general guidelines include;

- i. Movement and circulation
- ii. Developments along the river
- iii. Landscaping
- iv. Environmental Design


5.1.1 Movement and Circulation (Transport)


The key objective is to encourage and maximize alternative modes of transport within the precinct thus reducing carbon emissions and promoting a healthy lifestyle. An added advantage for Kasane and Kazungula could be the mitigation of watercourse pollution when parking is designated to fewer areas to facilitate better control and provision for filtration or screening of pollutants, in this case and primarily oil leaks from vehicles.

Aspects to be optimized are;

- a) Cycling lanes;
- b) Pedestrian lanes;
- c) Electric Rapid Bus Transit

These guidelines should be read in conjunction with the extensive Environmental design guidelines, refer to General Standard (GS6) regarding Transport as articulated in Appendix A, Environmental Design Guidelines

CATEGORY	RECOMMENDED	ILLUSTRATION
a) Cycling	<p>There must be dedicated Cycle lanes along President Avenue</p> <p>Kazungula turnoff junction.</p> <ol style="list-style-type: none"> 2. Provide Bicycle storage pods and lockers for cyclists at strategic locations along cycle lane in Kasane. 3. Proposed Width of cycle lane shall be maximum 3metres and minimum 1.5metres. 4. Proposed Surfacing material shall be Hot Rolled Asphalt or better. 	 <p>Typical dedicated cycling lane similar to the proposed. Source: web image, (Margie Ruddick)</p> <p>Example of bicycle storage pods along the cycling route. Source: design by Menthol architects inhabitat.com</p>
b) Pedestrian Sidewalk lanes	<p>There must be dedicated Pedestrian Sidewalk lanes in Kasane along President Avenue . All other smaller roadways in Kasane and Kazungula will also have proper dedicated sidewalks.</p> <p>Recommended Surfacing material is Brick pavers to Designers detail and specification. (See design palette at chapter 8.0)</p> <p>Width of pedestrian sidewalk lane along President Avenue is minimum 1.5metres and maximum 3metres.</p>	 <p>Typical separation of cars, bicycles and sidewalks as proposed. Source: www.slowottawa.ca</p>

CATEGORY	RECOMMENDED GUIDELINES	ILLUSTRATION
<p>c) Rapid Bus Transit</p> <p>In response to air quality and health concerns as well as rising fuel costs, most 'green inclined' destinations around the world are turning to hybrid-electric buses which consume less energy and produce significantly fewer emissions by combining an internal combustion engine with an electric motor.</p>	<p>This proposal is recommended for further detailed Feasibility study for its implementation and applicability in the study area.</p> <p>The Hybrid Electric Bus route could link Kasane airport to numerous strategic stops in Kasane along President Avenue, then through to Kazungula and the proposed Freight and Logistics precinct. It could also link to the Kazungula border facility and loop back to Kasane.</p> <p>The feasibility study should also identify a number of possible bus stop points along the route.</p>	 <p>Typical solar charging bus stop for electric buses. Source: www.earthtechling.com</p> <p>Example of an electric Bus in Gothenburg, Swede. Source: www.motowindia.com</p>

LEGEND

- Walkway
- Continuation to Kazungula
- Existing access point
- Potential new access point
- Node

5.1.2 Developments along the River

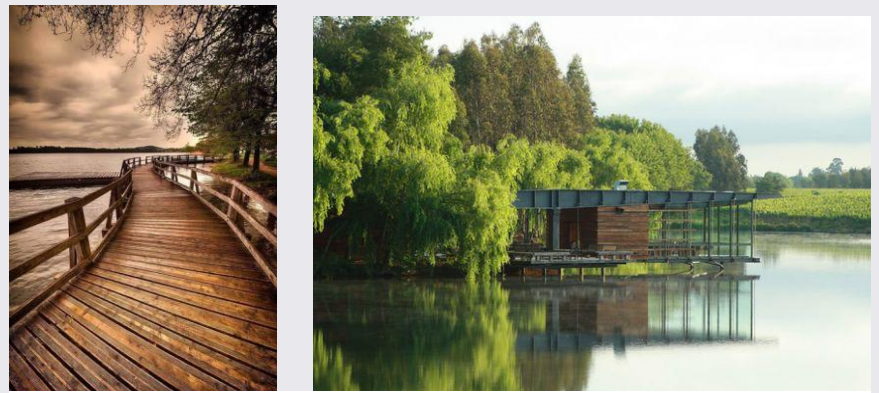
These guidelines refer to the last row of properties along the riverfront both in Kasane and Kazungula. There are certain common aspects that are opportunities and/or constraints and require guidelines.

'Capitalising on the river' is an important component of the broader vision for the Redevelopment Plan. However, any innovative design or development guideline

should endeavour to protect the riverine habitat as a whole. The following are categories under this heading:

1. Building Heights
2. Direct access to the river
3. Boardwalk
4. Architectural Language
5. Development on slope towards the river

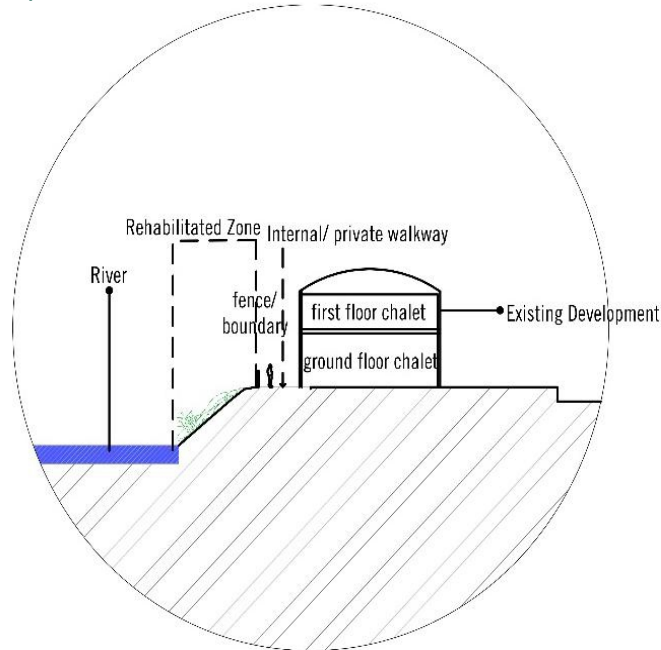


CATEGORY	RECOMMENDED GUIDELINES	ILLUSTRATION
1. Building Height	1. Maximum number of storey's for new developments on edge of the river is two (2) storeys capped at maximum 6 metres ground to top ceiling, Unless otherwise stated for specific Special sites. Obstruction will also be a consideration.	
2. Direct access to the river or Encroachment to the river buffer.	<p>1. Properties along the river bank are not allowed exclusive direct physical access to the river by boat unless given special approval to do so by the Building Control Committee (BCC)</p> <p>2. Special Concessions to encroach into the river shall be permissible for the following special projects that have potential to create unique and attractive experiences for the public. These will encroach into the river at specific sites.</p> <p>a) Jetty Feature Restaurant at the Riverfront precinct</p> <p>b) Conference facility at Kasane Precinct C (current Prisons Farm).</p> <p>c) Selected commercial leisure facilities located along the river and wishing to encroach into the buffer or the river bank. The illustration on the right shows permissible scenarios how such properties may relate and interact with the river. All such proposals should be to the approval of the Building Control Committee.</p>	 <p>Example of boardwalk over water. Source: www.schauberber.tumblr.com</p> <p>Example of feature restaurant in the water. Source: Gallery of Via Wines, courtesy Claro Arquitectos</p>

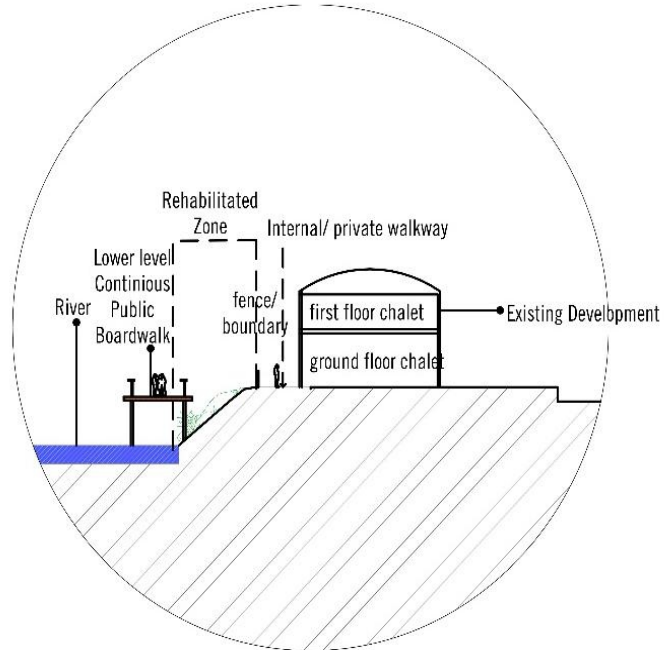
Note: The following page shows more design illustrations for developments along the river

DIRECT ACCESS TO THE RIVER - DESIGN GUIDELINES

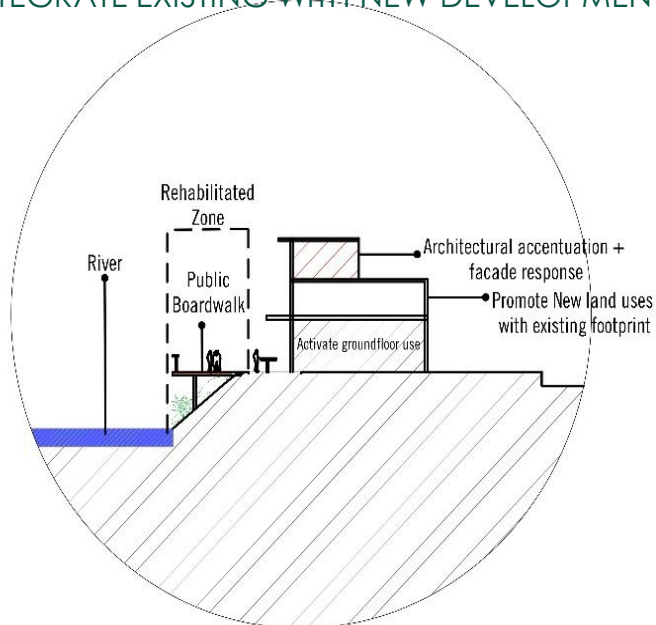
1) EXISTING DEVELOPMENT- STATUS QUO



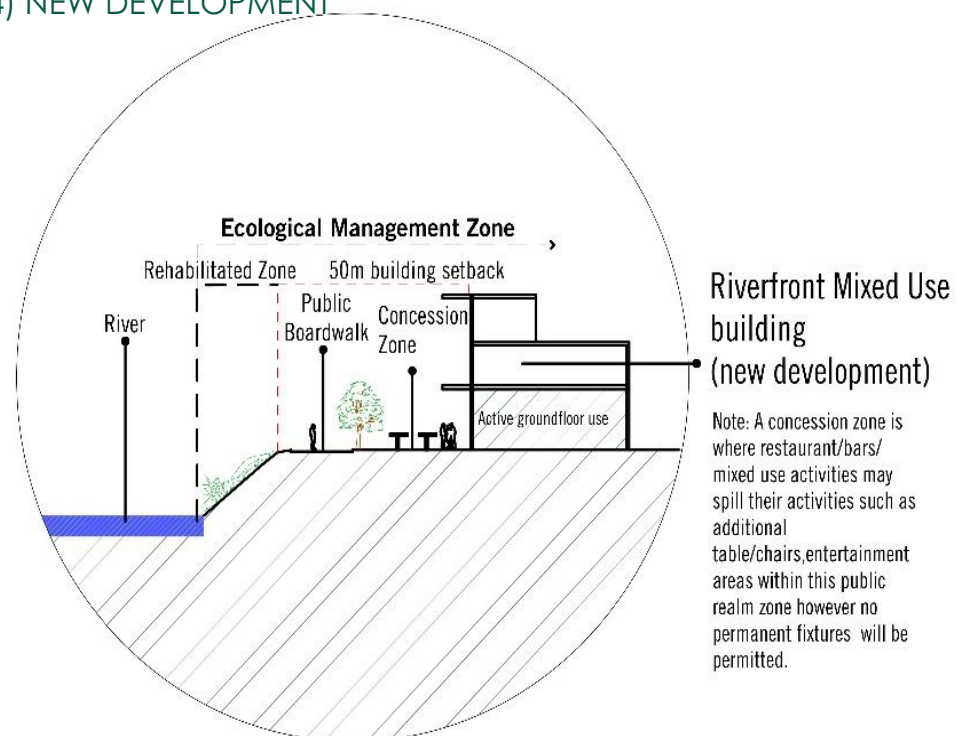
2) RETAIN EXISTING BUT PROMOTE PUBLIC USE & ENJOYMENT



3) INTEGRATE EXISTING WITH NEW DEVELOPMENT




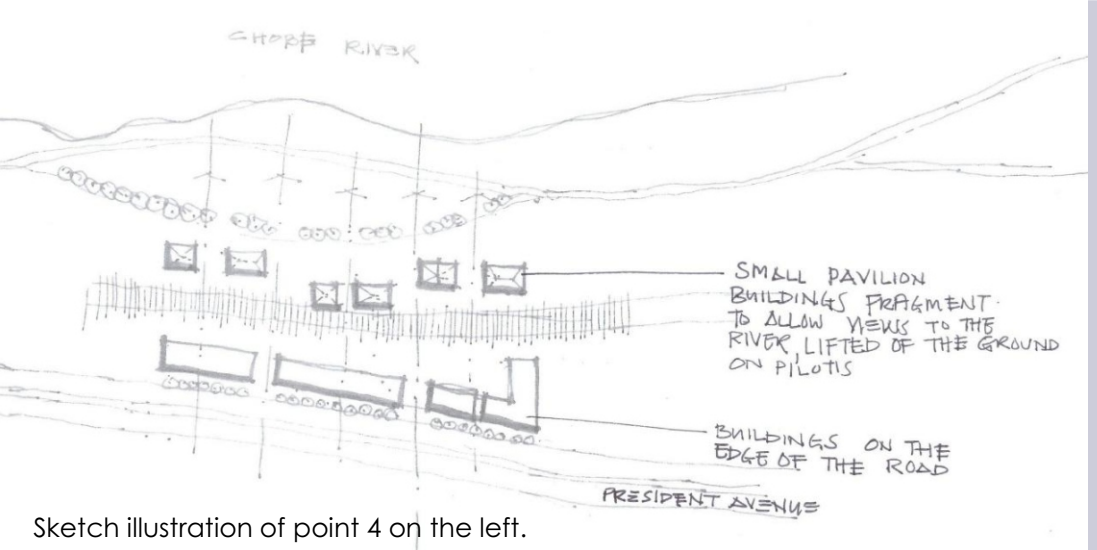
4) NEW DEVELOPMENT



Riverfront Mixed Use building (new development)

Note: A concession zone is where restaurant/bars/ mixed use activities may spill their activities such as additional table/chairs, entertainment areas within this public realm zone however no permanent fixtures will be permitted.

CATEGORY	RECOMMENDED GUIDELINES	ILLUSTRATION
<p>3. Boardwalk</p>	<ol style="list-style-type: none"> The alignment of the boardwalk should stay clear of riverine vegetation, so that there is little or no vegetation clearing on its path. The alignment of Boardwalk will vary according to the terrain and site conditions. It may be part on land (at grade) and part on raised level (deck) along the river bank. <ul style="list-style-type: none"> Where level is on land, walking surface shall be brick pavers or wooden deck to the specifications of the designer (refer Chapter 8,- Design palette for proposed pavers). Where alignment of Boardwalk is on a raised platform along or on the river, the structure shall be made of Wood and wooden rails shall be provided. Where necessary designer screening shall be used to shield from private properties along the river bank. Material for the construction and screening of boardwalk shall be indigenous construction material. 	 <p>Examples of possible screening materials for Boardwalk to attain privacy at certain places. (thatching grass and Reeds. Image is Dos Lagos walkway, California. Source: ranchoareubidoux.com)</p>





CATEGORY	RECOMMENDED GUIDELINES	ILLUSTRATION
<p>4. Architectural Language</p> <p>Developments along the river have a direct bearing on their environmental and visual impact on the river, therefore their architectural style has to be mitigated through these guidelines.</p> <p>These properties are located along ecologically sensitive and scenic tourist route used daily by tourist boats.</p>	<ol style="list-style-type: none"> Buildings along the river are to relate to the ground in such way that they minimise the physical impact on the ecosystem and the river tributaries. It is recommended that the use of Pilotis or Pile foundation should be used to suspend the building floors off the ground. (See illustrative sketch on the right column) Building orientation- A building along the river should not obstruct visual and physical access to the river of the immediate neighbour in terms of height and excessive continuous length along the river. The illustrative sketch on the right column shows the minimum guideline that should be applied on group of buildings along the river. Colour – Unless otherwise stated by the Building Control Committee, only Earthy colours of materials and paint shall be used on buildings along the river edge. The purpose is to eliminate possibility of visually offensive colours along the riverfront. Façade treatment and Materials. - Building façades on the riverfront should have balconies and wall openings (windows). No riverfront complete solid building wall will be allowed unless textured with indigenous material to the approval of Building Control Committee. Roof – The use of exposed Galvanised Roof Sheets is prohibited on buildings along the river. Other roofing materials and styles are subject to approval of the Building Control Committee. Boundary wall- Solid boundary walls are prohibited on properties on the riverfront. Only full height perforated fence is allowed. Maximum height (1.5metres) 	 <p>Sketch illustration of point 4 on the left.</p> <p>Note: Refer to Section 8- Design palette for proposed texture and colour palette.</p>



5.1.3 Public Landscaping Guidelines

These guidelines provide an overarching framework to the general landscaping of public open spaces, parks and street corridors in the study area. Where there are detailed precinct plans, landscaping pockets have been provided for further landscape design detailing.

The public space landscaping should be designed and developed as a important component of the public infrastructure development and **not afterwards**. This is important because landscaping of the public spaces and street corridors has been identified as a catalytic factor towards the whole redevelopment project of Kasane and Kazungula

CATEGORY	RECOMMENDED GUIDELINES
1. Vegetation and Planting	<ol style="list-style-type: none"> 1. Existing trees in all development sites in the study area should be preserved and not cut. Where cutting is necessary, permission should be sought from the Building Control Committee. 2. In an effort to improve tree canopy in Kasane Kazungula, all new building developments should plant minimum 4 trees additional to the trees required for parking as a condition for occupation permit to be granted. Minimum tree size required is 40 litre container. 3. With the exception of street trees, all introduced plants and trees should be planted in clusters or groupings to create a more ecological natural look and effect. 4. Street trees along the proposed President Avenue Boulevard should meet a minimum standard of 100 litre container size. 5. Street trees along boulevard to be placed at 10 metres-on-centre along the highlighted tree line. 6. Only indigenous evergreen Tree Species should be used on President Avenue boulevard. Specific tree species to be determined by the landscape architect. 7. Once public landscaping is developed, private developers will be responsible for any damage caused to landscape fixtures/elements as a result of construction activities undertaken by their developments. 8. The damaged landscape elements are to be repaired to their original condition or replaced with approved elements of the same quality and type. 9. To enforce item 7 above, the developers will be required to post a refundable bond that meets the value of the adjacent public landscape fittings immediately surrounding their project, before they get issued a building permit.

CATEGORY	RECOMMENDED GUIDELINES	ILLUSTRATION
<p>2. Street Furniture Street furniture items will have to be coordinated in a creative and consistent manner in order to have significant impact in the quality of public space in Kasane and Kazungula.</p> <p>The street furniture scheme should be developed as a single group, utilising a particular design theme and colour palette.</p>	<p>1. Street Signs It is recommended that a comprehensive signage system should be developed for Kasane Kazungula Redevelopment Plan. It should address full range of requirements for directional and advertisement signs. The scope should address Sign Type and Materials that the signs could be made of. The system should be consistent such that colours and materials for different signs are standard. The design of the street signage system must be integrated with rest of public landscaping fixtures design language.</p> <p>2. Street Lights</p> <ol style="list-style-type: none"> Street lights are a powerful component of streetscape in any town. It is preferred that street light fixtures for this project are custom designed to achieve a unique ambient experience. Alternatively a specialist supplier should be sought offering specialist design fixtures. Preference should be given to products with high green design principles. Lighting for pedestrian sidewalk, bicycle lane and Boardwalk shall be Bollards. Street light standards should have provision for attachments of banners as appropriate, for easy installation and removal during civic holidays or special events. Refer to Chapter 8-Design Palette for specific proposals for Streetlight fixtures. 	 <p>Example of a customised street signage system. Source styleweekly.com</p>  <p>Example of signage and street light design coordination. Source styleweekly.com</p>  <p>Example of street Bollards. Source: structura.com</p>
	<p>3. Bicycle Racks and Bus Stops Bicycle racks and Bus stops should be custom designed for this project and should uphold high standards of contemporary, green and clean design. The designs should be integrated with other landscape features in the locality and should have a decorative appeal to the general landscape.</p> <p>Bicycle racks should provide for safe locking of bicycles by cyclists. The structure should also provide alternative for use by commercial bicycle renting private businesses.</p> <p>Bicycle racks shall be custom made for the project and their Construction or Surface treatment shall be made of indigenous construction material.</p>	 <p>Example of bicycle rack as street furniture. Source: www.cyclespaces.com</p>

CATEGORY	RECOMMENDED GUIDELINES	ILLUSTRATION
<p>2. Street Furniture .Street furniture items will have to be coordinated in a creative and consistent manner in order to have significant impact in the quality of public space in Kasane and Kazungula.</p> <p>The street furniture scheme should be developed as a single group, utilising a particular design theme and colour palette.</p>	<p>4. Benches, Dustbins,</p> <p>a) Seating shall be provided along active pedestrian corridors.</p> <p>b) Benches should be placed to take advantage of various conditions such as sun, shade, active, quite, closed and open pockets.</p> <p>c) Bench placement should avoid large open areas that radiate heat or reflect large amounts of glare.</p> <p>d) Dustbins shall be located alongside benches., bus stops and parking areas.</p> <p>e) Dustbins must be weatherproof and fireproof, and should have a controlled cover to contain smells and insects.</p>	 <p>Example of dustbins that promote separation and recycling of waste as proposed. Source: architonic.com</p>
	<p>5. Street Art Street Art in this context refers to commissioned works of Public Art like sculpture, wall murals, etc. Art displays may be permanent or temporary as may be determined by the Building Control Committee</p> <p>a) It is recommended that special Public Art projects be undertaken at the certain places not limited to the following:</p> <ul style="list-style-type: none"> •River front Precinct – Kasane •Proposed traffic circles – Kasane •Along propped Boardwalk – Kasane •Sports Precinct – Kasane •Certain locations along President Avenue – Kasane •Proposed Main Kasane/Kazungula Traffic Circle Junction – Kazungula <p>b) All street Art Sculptures shall bear strong Environment and Cultural context to Kasane and Kazungula.</p> <p>Refer to Chapter 8-Design Palette for guidance on textures and colours.</p>	 <p>Examples of Street Art installations. Source: flicker.(mark pearson)</p>

5.2 GENERAL ENVIRONMENTAL DESIGN GUIDELINES

4.1.1 Definitions:

Compact Car: A car not exceeding 4100mm long and 1600mm wide in body size and with an engine capacity not exceeding 1.4 litre

Construction Site: The area within which the actual or intended development is to take place

Cut and Fill: A method of modifying the existing terrain and slope to create a flat surface by cutting to below natural grade and filling the immediate surroundings.

Day-light Factor (DF): The percentage of internal illuminance to the external illuminance at a given internal surface

Developer: The entity with a lawful, contractual right or obligation to develop the property

Excavated Material: Soil, sand or rock removed as a result of excavations within the Construction Site

Notional Building: An ideal version of the actual building intended to be built and conforming fully to the set standards of performance.

Pay-Per-Visit: Payment for each access to a facility

Plot Area Ratio: The ratio of the total gross floor area of the building to the plot area.

Plot Coverage: The percentage of the area of the plot covered by the building

Practical Completion: Completion of construction to a level permitting the full use of facilities as intended.

Thermal Gradient: An indication of change in temperature within the building envelope material due to its thermal resistance

Topsoil: The uppermost layer of soil with organic and micro-organisms necessary to support plant life

Vegetated Roofs: A flat roof on which it is incorporated, in an evergreen condition and with suitable drainage and water proofing, plants in pots or trays, and may include ornamental shrubs, grasses, succulents and ground covers.

R-Value: The resistance of the material to heat flow across its unit area ($m^2 \text{ } ^\circ\text{C}/\text{watt}$)

U Value: The ability of the material to transfer heat across its unit area ($\text{watts}/m^2 \text{ } ^\circ\text{C}$)

4.1.2 Normative References

ASHRAE 90.1 (2013): Energy Standard for Buildings Except Low Rise Residential Buildings.

ASTM E1980-11: Standard Practice for Calculating Solar Reflectance Index for Horizontal and low-sloped Opaque Surfaces

BOBS 463:2011: Standard for Waste water for Irrigation

CIBSE Lighting Guide 6: The Exterior Environment

ISO 7730-2005: Ergonomics of the Thermal Environment

Manual of Tropical Housing and Building, Part 1 Climatic Design; by Koenigsberger, Ingersoll, Mayhew, Szokolay

SANS 204 (2011): South African National Standard: Energy Efficiency in Buildings

4.1.3 THE CLIMATE OF KASANE/KAZUNGULA

The Kasane/Kazungula planning area is located along latitude 17.82 South and longitude 25.15 East. This area is the most northerly located township in the country and the furthest from the Tropic of Capricorn. The area is also located along the southern edge of the Chobe River- a perennial river forming a large water body with a significant influence on its micro-climate.

The micro-climate of Kasane/Kazungula can be described as a composite/tropical upland type. It is, in this regard, neither consistently hot and humid nor hot and dry. Unlike a composite climate, winters can be considerably cold, with minimum temperatures well below 10°C for several months in a year. Humidity levels can be high- ranging between 50% and 90% Relative Humidity (RH) over a number of months and predominantly during the hot season.

Because of its latitude and unlike towns far south of the country, its buildings have considerable exposure to incident solar radiation, during the hot season, from the South East and South West, in addition to exposure between the east and the west-an important consideration for environmental design to prevent overheating of interior spaces and for energy conservation

. Its proximity to and south of the Chobe River influences its micro-climate in the form of light breezes due to predominantly easterly and north easterly winds. Winds speeds of up to 7 metres per second occur and average 3 to 4 metres per second throughout the year (source: <https://weatherspark.com>). The prevalence of higher wind speeds overlaps the hot humid season and points to potential benefit from breezes to enhance thermal comfort and to the impact of this condition on physical planning and the design of buildings.

Like the rest of the country, Kasane/Kazungula enjoys long sunshine hours and a high percentage of sunshine days in a year with high solar irradiance making it worthwhile to consider renewable solar energy technologies either to meet part of the daily demand (up to 50% using simple and small scale roof top integrated technologies) or **Net-Zero Power** for certain building typologies. Total annual rainfall averaging above 600mm is also sufficient to support the adaptation of **Net-Zero Water** technologies. The above climatic conditions, therefore, auger well for success in the adaptation of the state-of-the-art and latest technologies in green building design and construction.

4.1.4 BROAD CONSIDERATIONS OF ENVIRONMENTAL DESIGN

This part articulates the broad aspects of environmental design (green building) as widely practiced internationally. It provides the user of the guidelines with background information as to their purpose and the significance of the various aspects, selection from international bench-marks or adaptation of parameters for the assessment of environmental design submissions. Based on such aspects and parameters, sets of standards have been formulated for application on specific zones and precincts. The choice of standard is based on the sensitivity of the precinct, its significance and functions thereon as informed by the urban design master-plan.

Broad categories of Environmental Design are;

- Indoor Environmental Quality (IEQ);
- Energy Efficiency;
- Water Efficiency;
- Land-use and Ecology;
- Materials;
- Transport;
- Emissions.

Indoor Environmental Quality (IEQ):

- Indoor Air Quality;
- Thermal Comfort;
- Day-lighting;
- Noise pollution and Noise control;
- Ambience.

1.2.1.(a) Indoor Air Quality (IAQ):

IAQ involves the control of pollutants and contaminants- e.g. carbon dioxide, entrainment of vehicle exhaust smoke, etc. Some contaminants may come from building materials- e.g. Polychlorinated Biphenyls from some lighting fixtures, Formaldehyde from processed timber products, Volatile Organic Compounds from paints, etc.

IEQ also accounts for ingestion of hazardous materials and substances. Common contaminants are lead from paints, asbestos from asbestos containing materials and minerals, and certain zinc compounds and lead found in paints. Mould infestation promoted by air conditioning systems may also be a significant problem for Kasane when humidity is high in summer. The risk of legionnaires from water based heat rejection systems also exists. Particulate matter may have a significant bearing on IAQ in a localized environment. Common sources of such pollution include wood and other fossil fuels.

The risks involved from poor IEQ range from poisoning through inhalation or ingestion, irritation of the respiratory and gastrointestinal tract to cancer.

Prohibition as well as design guidelines according to selected international standards can be incorporated to mitigate the risks. An important criterion for assessing IAQ is ventilation (mechanical or natural) and the supply of fresh air.

(b) Thermal Comfort (TC):

This involves the provision of physiological comfort in the indoor in accordance with human comfort criteria- temperature, humidity radiation, and air speed. Provisions and guidelines for TC must also be balanced with those for energy efficiency and IAQ for optimal performance as excessive introduction of fresh air from the outside, for example, may compromise energy efficiency on account of heat gain or loss through convection. Similarly, excessive day-lighting contributes to heat gain through direct radiation as well as heat transfer through glass by conduction which typically has high transmittance (U value).

TC for most occupied spaces, like energy efficiency, is influenced primarily by building envelope design and, to a relatively lesser extent, internal heat gains. Boundaries for TC are defined by the Comfort Zone and international standards, such as ISO7730, for predicting TC during the design stage have been developed. Where the mechanical engineering design is based on dependable standards such as ASHRAE 90.1, an optimal balance between the various factors of IAQ, TC, energy efficiency and day-lighting can be achieved.

(c) Day-lighting:

The human eye prefers natural lighting. Natural light should thus be provided for normal physiological comfort. Like TC, it should be provided optimally to maximize energy efficiency and to strike a good balance with artificial lighting.

The measurement of day-lighting is in Daylight Factor (DF). Typically 2 % DF is required to a certain area of occupied space. Whilst computer simulation tools exist to calculate DF, it can also be estimated manually by a designer. Computer simulations also make it easier to assess the combination of day-lighting and artificial lighting, whereby the latter is usually required within deeper sections of the occupied space. The need for augmentation of day-lighting with artificial lighting is a factor of function and configuration (design) of the occupied space and its relationship to the sky. Thus day-lighting criteria influence building form and will have a bearing on Form Based Coding as may be adopted for specific precincts and sites.

(d) Noise Pollution and Noise Control:

Noise pollution deals with the control of noise from sources external or internal to the space being occupied. It must be distinguished from acoustics which is concerned with the design of spaces for speech or music.

Building envelope design and interior partitioning plays a key role in controlling noise pollution by minimizing noise penetration. Noise penetration is measured in terms of Sound Transmission Class (STC) rating of the material, whereas acoustic performance involves the control of reverberation and absorption of sound to yield good transmission of speech or music. Noise levels within a space may also be measured in terms of Noise Criteria (NC)- the level of noise at varying frequencies or octave bands.

Depending on location as well as function, some buildings may require good acoustics whilst others may require high levels of noise control. The need for noise control is anticipated for buildings in close proximity to the Kazungula Transport Hub and the movement of trucks and trains. It is also important to control noise in places such as apartments and classrooms. Acoustic design is anticipated in the development of the museum building and conference hall(s).

(e) Ambience:

Ambience is the quality of the environment to provide for visual and sensory comfort. It is the opposite of a claustrophobic space which in this case can benefit from the views of the river. Site planning of the various sites and their key spaces should consider ambience in terms of the relationship with Chobe River or open spaces such as courtyards. However, provision for ambience may conflict with requirements for energy efficiency depending on the orientation of the window and the overall strategy and design of the building envelope.

Energy Efficiency:

It may be useful to note that buildings account for 40 % or more of energy consumption worldwide. Energy efficiency in buildings also has strong connections to carbon emissions for countries that rely heavily on coal fired thermal power stations. As such this consideration should receive high priority in the environmental design guidelines for Kasane/Kazungula, given that Botswana relies heavily on thermal power. Strategies for promoting solar energy and other sources of energy with low carbon emission should be pursued in order to offer and promote Kasane/Kazungula as a green tourism destination.

Building energy efficiency primarily involves building envelope design to minimize thermal transmittance and to maximize Thermal Comfort-in this case, heat transmission and choice of materials, internal heat gains from occupants, appliances and fittings- e.g. lighting fixtures within the indoor space. It may also be influenced by water efficiency as in the generation and handling of hot water for human use as well as for utilities like laundry, industrial and domestic kitchens. In these guidelines water efficiency, therefore and accordingly, considers energy conservation and vice-versa.

Building envelope design and other aspects of the development may be considered from the point of view of embodied energy- energy consumed in the sourcing, manufacturing and use of all materials-from "Cradle to Grave". This concept is important from the point of view of emissions and power generation to support industrial activity for the manufacturing of some of the building materials commonly specified.

Guidelines for building envelope design commonly involve the specification of Envelope Thermal Transfer Value (ETTV) expressed in watts per square meter (w/m^2) of energy transmitted depending on the thermal performance of the building envelope, i.e. transmittance (U Value) in watts per square meter per degree celcius ($W/m^2/^\circ C$), Solar Heat Gain factor (SHGF) of glazed components and their shading coefficients. ETTV International benchmarks have been considered to arrive at a suitable standard for the planning areas. Although the calculation of ETTV might be cumbersome for most architects it is well within the ability of a competent mechanical engineer – a skill that is expected to be available as part of the consultant team working on most developments (public and private) other than private dwellings. The simpler alternative, which has been adopted, in the guidelines, is to specify the limit, in U Value, for each component of the building envelope- roof and walls, as well as maximum Solar Heat Gain Factors where glass is extensively used. The designer shall then not exceed the specified limits and shall provide details of the design and specifications of materials used for assessment by a competent official of the local authority.

Energy efficiency is also influenced by orientation, extent, positioning and exposure of the building components- walls, glazing and roofs. Accordingly, and as with day-lighting, such criteria will influence building form: proportion, inclination, positioning of glazing and use sun-shading devices. Sun control is, therefore, an important component of the Environmental Design Guidelines.

Water Efficiency:

This aspect involves the minimization of the use of potable water. In terms of technologies now available, water recycling is an important component of water efficiency. Apart from its link to energy efficiency and embodied energy, it also mitigates discharge to the municipal sewerage works and can yield cost savings in that regard. General restrictions on the use of potable water may be imposed and requirements to incorporate certain technologies to reduce potable water are often stated. Further improvement of water efficiency can be encouraged through voluntary means and reward for certain achievement in accordance with green building rating tools. The latter allows the designer and developer freedom in the choice and application of the available technologies.

Land-use and Ecology:

The key objective is to reduce the negative impact on ecological systems and biodiversity by maximizing development of land with limited ecological value and use. Whilst the Strategic Environmental Assessment (SEA) will provide a baseline, key issues as typically considered in environmental design are;

Topsoil: The preservation of its integrity, classification, protection or improvement in terms of whether it is productive, already protected or impacted;

Land-reuse and Reclamation: The identification of sites to be reclaimed, encouragement of development on reclaimed rather than on land with already high ecological value and enhancement of ecological value where beneficial or necessary;

Urban Heat Island Effect: Reduction and impact of heat from hard landscaping on the micro-climate and therefore the human and wildlife habitat. Guidelines on the choice of paving materials may be compiled on the basis of their Solar Reflectance Indices. Shading elements or vegetated roofs may be specified for certain spaces/buildings to reduce reflectance or glare whilst others may be enhanced to create light shelves and thus improving day-lighting.

Control of urban heat island effect has the added benefit of contributing positively to energy conservation associated with the mechanical cooling of interior spaces on account of reduced cooling loads from the building envelope. Building height and density directly affect Urban Heat island Effect and are to be kept to a minimum to mitigate negative impacts. Control of density within the Ecological Zone ties well with other ecological considerations. Hence these parameters have been considered in the environmental design guidelines.

Watercourse Pollution: Minimization of storm-water runoff and pollution of natural watercourses, in this case the main channel to which all storm-water cascades, past the developed area. This involves the control of surface pollutants, e.g. oil, through the location and design of sediments arrestors, sand filters, swales, etc. Other solutions may include bio-basins (planted and shaded infiltration systems, vegetated filter strips, solid waste and bio-degradable organic waste screening devices across storm-water channels;

Discharge to Sewer: Minimization of discharge of waste to the municipal sewerage works. This involves the treatment, storage and use of treated water for non-potable uses such as irrigation- an important consideration as the extraction of raw water from the river might be restricted by international law. Water efficiency contributes directly to the reduction of discharge of wastewater to the sewerage works.

Light Pollution: Minimization of excessive light emission to the night sky and surrounding open spaces. Existing research indicates that this has the potential to affect wildlife and ecosystems by disrupting natural patterns and behavior. This includes the disruption of migration and other activity of nocturnal birds as well nocturnal activities of other varied forms of wildlife.

Air Pollution: Minimization of the presence of substances in the air that can have adverse effects on human health as well as the ecosystem. Pollutants can comprise of gases, suspended liquid droplets and solid particulate matter. Air pollution is a factor primarily of commuting mass and goods transport and heavy industry involving machinery and plant powered by fossil fuels. Extensive use of wood or other solid fuel may also contribute to air pollution.

Waste Management: Minimization of building rubble, other waste going to disposal as well as mitigation of impact of waste in the locality.

Consideration and the development of guidelines for some of the above are partly informed by the SEA and may influence the spatial planning of various parcels of land and could lead to recommendations for amendments of the urban design master-plan as an ongoing process.

Materials:

From the point of view of environmental design guidelines and the way they are structured, the multiple objectives are;

- elimination of contaminants and hazardous building materials;
- reduction of embodied energy and carbon emissions, in particular concrete and steel which are high in embodied energy from their industrial processing using power from coal fired generation plants;

Consideration in the specification of building materials should be made of;

- storage, recycling and reduction of waste disposal to the land-fill;
- reuse, disassembly and alternatives to minimize the consumption of raw materials;
- Health hazards from certain materials;
- Timber from a sustainable source such as a registered forestry;
- Local sourcing of materials from closest to the site to reduce carbon emissions associated with their transportation as well as to promote the use of regenerative materials that could be sourced from and harvested by the indigenous people within or close to the urban districts.

The above-listed, save for provisions relating to reduction of waste to disposal, locally sourced and hazardous materials, are best dealt with and maximized under the Voluntary Standards.

Transport:

The key objective is to encourage and maximize alternative modes of transport within the precinct thus reducing carbon emissions and promoting a healthy lifestyle. An added advantage and connection to environmental design for Kasane and Kazungula is the added mitigation of watercourse pollution when alternative mass transport is considered and parking is designated to fewer areas to facilitate better control and provision for filtration or screening of pollutants, in this case and primarily oil leaks from vehicles. On account of the connection to emissions, the use of smaller vehicles is promoted by designating a certain ratio of parking for such vehicles and building-in disincentives for the use of large passenger cars or vehicles.

Aspects considered and optimized, in relation to the above objectives, could include;

Cycling;

Walking;

Canoeing;

Donkey cart

Electric cart;

Other form of public transport between nodal points and districts.

Facilities are required to support some of the modes of transport mentioned above, and these include;

Change rooms, showers and lockers;

Weather protection for commuters;

Lay-by structures along the spine or corridor;

Signage and availability of information along routes (Information Kiosks).

Other issues that are to be considered include accessibility with regard to distance between nodal points vis-à-vis mode of transport as well as location of amenities and safety based on that mode of transport.

Some of the aspects of the above environmental design considerations are dealt with under the section dealing with transport and graphically illustrated in the main write-up as they do not all translate into General, Compulsory or Voluntary Standards applicable to the development of specific sites or precincts.

Emissions:

In terms of the Kasane/Kazungula Environmental Design Guidelines and the manner in which they are structured, the key objective is to minimize Ozone Depletion Potential (ODP) and Global Warming Potential (GWP). This may involve restrictions on the choice of refrigeration gases and the extent of use of materials that are high in embodied energy such as steel and concrete. Emissions are also linked to transport and modal choice. Thus this green building design consideration of carbon footprint is not necessarily confined to the area to be developed. Furthermore, the control of greenhouse gas emissions is significantly linked to energy efficiency of the building, a good part of which is incorporated into the General Standards section of the guidelines. Enhancement of performance under Voluntary Standards (Part 2 below) is meant to further contribute to the reduction of emissions.

4.3 Arrangement of Environmental Design Guidelines

The guidelines are divided into three (3) categories of standards as illustrated under below;

1) GS: General Standards

2.) CS: Area Specific Compulsory Standards

3.) VS: Voluntary Standard

General Standards apply to the whole of the Kasane and Kazungula area, to the extent of the urban design intervention. These standards represent the minimum requirements for all precincts and sites.

Area Specific Compulsory Standards apply to specified precincts and sites and are additional to the General Standards and as measures to respond to the sensitivity of the zone and enhancement of its ecological and tourism value.

Voluntary Standards are incentive driven. The developer adopts, at own discretion, an internationally recognized green building standard with the primary objective of achieving a rating. The development must still meet the requirements of the General and Area Specific Compulsory Standards. Whilst the achievement of a rating is regarded as an investment with potential returns in the form of the caliber of tenants, long term competitiveness in the advent of the green building movement, etc, rewards or subsidies on the cost of obtaining a rating can be granted by the local authority, at its own discretion, to create the necessary momentum in adopting the highest standards of environmental design and construction.















4.4 Significance of Environmental Design Standards:

Whilst the standards do not entirely substitute other building codes and regulations, they play a pivotal role in aligning the conceptualization and implementation of development with the ecological sensitivities and economic value of the area and take precedence, in that regard, over existing instruments.

4.5 Illustrations and components of the Standards

The following pages are the illustrations and the primary components of the standards as outlined in the illustrative diagrams. Each standard is made up of codes and sub-codes. Descriptions of the each standard in relation to each sub-code are provided. References to other internationally recognized standards have been made where necessary and relevant.

GS: General Standards

						
GS1: Indoor Environmental Quality (IEQ)	GS2: Energy Efficiency	GS3: Water Efficiency	GS4: Land-use and Ecology	GS5: Materials	GS 6: Transport	GS7: Emissions
GS1-1: 	GS2-1: 	GS3-1: 	GS4-1: 	GS5-1: 	GS6-1: 	GS7-1: 
Indoor Air Quality/Indoor Environment	Envelope Thermal Transfer Value (ETTV)	Potable Water Restrictions	Topsoil	Contaminants and Hazardous Materials	Designated Parking for Compact Cars	Restrictions and Other Requirements
GS1-2: Day-lighting	GS2-2: Thermal Transmittance of Primary Building Components	GS 3-2: Water Recycling	GS4-2: Urban Heat Island Effect	GS5-2: Local and Regenerative Materials	GS6-2: Bicycle Parking	
GS1-3: Thermal Comfort	GS2-3: Total Energy Consumption and Maximum Demand	GS3-3: Water Saving Measures	GS4-3: Watercourse Pollution and Surface-water Run-off		GS6-3: Parking Location Restrictions	
GS1-4.: Noise Control and Acoustics	GS2-4: Site Layout and Floor Planning		GS4-4: Light Pollution		GS6-4: Amenities	
GS1-5: Ambience	GS2-5: Sun Control and Artificial Lighting		GS4-5: Waste Management			
			GS4-6: Land Reuse and Reclamation			

GS: General Standards

GS 1: Indoor Environmental Quality

GS1-1: Indoor Air Quality (IAQ)

GS1-1-1: Ventilation and Air Change:

The minimum ventilation rate for a mechanically ventilated and occupied space shall be;

- 5 litres/second/person for single storey residential building ;
- 8 litres/second/ person for all other buildings

Minimum air changes for mechanically ventilated spaces where there are no requirements to create special conditions for negative or positive pressure shall be 10 Air Changes per hour.

GS1-1-2:Provision for natural ventilation in occupied spaces shall be such that at least two (2) openings are located to facilitate **Cross Ventilation** and where the smaller of the openings is not less than five percent (5%) of the floor area of the room. Openings should be positioned and configured to promote even distribution of ventilation. Exhaust air openings not located on an external wall shall be directly connected to a ventilation flue or corridor with openings at either ends of not less than ten percent (10%) of the area of the smallest of its four (4) sides or 2.5% of its total area. Internal exhaust air vents shall be adjustable to guarantee air tightness as may become necessary during cold conditions.

GS1-1-3:All window openings to occupied spaces shall incorporate mosquito screens affixed to permit the full cover of the opening at all times.

GS1-1-4:Garages or enclosed vehicular parking spaces shall have openings at not less than 5% of the floor area to facilitate natural ventilation directly to the exterior or alternatively equipped with a mechanical extraction system where displacement air is drawn from the exterior and expelled by means of a duct or exhaust flue. Internal access to a garage space abutting an occupied space shall be by means of a vestibule with ventilation in accordance with guideline GS1-1-2.

GS1-1-5:All air conditioning systems shall incorporate humidity monitoring and control to mitigate the propagation of mould and dust mites.

GS1-1-6: Where shared or centralized bulk photocopying and printing is provided, an extraction system shall be installed to expel fumes or gases directly to the outside.

GS1-1-7: Provision shall be made to regularly test for the presence of bacteria and for disinfecting any water based heat rejection systems. Such maintenance shall be documented and made part of the as-built maintenance manuals to be handed over to the property owner upon **Practical Completion** of the development. A record of such testing shall be lodged with the local authority.

GS1-2: Day-lighting

GS1-2-1: All buildings shall provide natural lighting at a minimum of 2% Day-light Factor at desk level to sixty five percent (65%) of the occupied spaces.

Exceptions to this Standard include;

- Supermarket;
- Auditorium;
- Operating Theatre
- Specialized dark or processing rooms.
- Residential Building

GS1-2-2: Provisions to reduce glare whilst not compromising day-lighting for offices and other working spaces shall be demonstrated in the design of fenestrations

GS1-3: Thermal Comfort

GS1-3-1: The design of occupied spaces shall provide for Thermal Comfort using Thermal Comfort prediction methods as per **ISO7730**.

Exceptions to this standard include;

- Residential building

GS1-4: Noise Control and Acoustics

GS1-4-1: All Interior partitions between spaces for the exclusive use of different occupants and external walls shall have a minimum Sound Transmission Class (STC) rating or Noise Criteria (NC) of 40 db(Audible Frequency (A)).

GS1-4-2: Spaces requiring speech intelligibility shall have a maximum reverberation time of 0.7 seconds. Interior surfaces shall have a Noise Reduction Co-efficient (NRC) of not less than 0.6. Acoustic modeling for auditorium, large conference hall, foyer or lobby more than 200m² in floor area shall be provided together with the application for building permission.

GS1-4-3: Openings directly facing any vehicular or locomotive traffic noise source within a distance of sixty (60) metres shall incorporate absorbent baffles, canopies, louvres or other means so as to limit the noise to 40db (A).

GS1-4-4: Main arterial roads and along which there are developments with a plot boundary within a distance of forty (40) metres from the centre line of the carriage way shall be lined with a non-deciduous trees of a mature height of not less than five (5) metres, sufficient to form a noise barrier canopy from their foliage and located at a maximum of six (6) meters from the edge of the driveway. Tree planting interchanged with sculptural pieces made of translucent, ultraviolet light resistant material and of equal cover to the tree foliage is permitted.

GS1-5 Ambience

GS1-5-1: Where part of the building envelope to an occupied space or circulation area abuts a **Landscape Feature**, good view of such feature shall be provided from any position along the said part of the building envelope. The total area of the opening provided for this purpose shall not be less than;

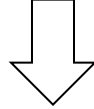
- Occupied Space: thirty percent (30%) of the wall area of the building envelope component abutting the Landscape Feature;
- Circulation space: fifty percent (50%) of the component of the building envelope abutting the Landscape Feature.

Glazing of the opening shall satisfy the requirements of Standard GS2-5 (Sun Control), GS1-2 (Day-lighting) and GS2-2 (thermal transmittance of Curtain Wall Glazing).

GS: General Standards



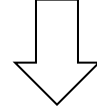
GS 3: Water Efficiency



GS3-1: Potable Water Restrictions:

GS3-1-1: The use of potable water directly from the public utility supply is prohibited for the following;

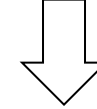
- irrigation of any kind;
- water fountains or features; and
- car wash



GS3-2: Water Recycling

GS3-2-1: Water treatment and recycling is encouraged but shall be subject to the approval of the Department of Waste Management and Pollution Control

GS3-2-2: Recycled water quality for irrigation shall conform to the **BOBS** 463:2011 standard



GS3-3: Water Saving Measures

GS3-3-1: Evidence, in the form of a schedule of the incorporation of water saving measures supported by technical data bulletins and sanitary ware specifications for the building project shall be provided as part of the application for building permission.

GS3-3-2: A potable water loss management plan to detect and expeditiously locate and repair leaks shall be developed for approval by the local authority.

GS3-3-3: The choice of plant species shall be such that they do not require the installation of a permanent irrigation system.

GS3-3-4: A technical feasibility study and cost/ benefit assessment indicating that at least two (2) alternatives to a water based heat rejection system were considered shall be submitted for approval by the local authority.

GS3-3-5: Provision of isolation valves for each floor sprinkler system shall be provided.

GS3-3-6: Where the regular testing of fire fighting system expels water, provision shall be made for its collection and reuse.

GS: General Standards

GS 4: Land-use and Ecology

GS4-1: Topsoil

GS4-1-1: Any **topsoil** removed during construction shall be stored cleanly and separately from building rubble or waste and shall be protected from degradation and erosion.

GS4-1-2: All topsoil stockpiled on the Construction Site shall be reused for landscaping as a base or top layer . Where such topsoil is used a top layer, it shall be spread at a depth not less than 200mm.

GS4-1-3: Sufficient **Excavated Material** should be stored on site for reuse as a base for the contouring of landscaped areas.

GS4-1-4: Sediment traps within the **Construction Site** shall be provided so as to trap all topsoil for regular collection and re-spreading.

GS4-1-5: A development involving the reclamation and re-use of land shall be supported by an environmental assessment confirming the extent to which topsoil is impacted and measures to be undertaken to restore its ecological value.

GS4-2: Urban Heat Island Effect

GS4-2-1: All hard landscaping surfaces shall have a Solar Reflectance Index of at least 29.

GS4-2-2: All roof surfaces shall have an average Solar Reflectance Index of at least 60. The exception to this standard is the roof surface under vegetated areas- Area Specific and Compulsory Standard: CS4-2 (Vegetated Roofs).

GS4-2-3: All hard landscaping surfaces other than parking spaces and driveways shall not be greater than twenty five percent (25%) of the area of the open space.

GS4-2-3: Non-deciduous plant species shall be selected to guarantee maturity within five (5) years of occupancy of the development.

GS4-2-4:Maximum **Plot Coverage** and **Plot Area Ratios** within the zones shall be;

	<u>EZ</u>	<u>UMZ</u>
▪ Plot Coverage:	25%	50%
▪ Plot Area Ratio:	0.625	2.0

The maximum height of buildings (measured from natural ground level at the highest point) within the zones, and abutting President Avenue, shall be twelve (12) metres and two and half (2.5) storeys within the Ecological Zone (EZ) and sixteen (16) metres and four (4) storeys within the Urban Management Zone (UMZ). The maximum height of buildings along the river front (measured from the platform) shall be five (5) metres.

GS4-3: Watercourse Pollution and Surface-Water Run-off

GS4-3-1: A Surface-Water Management Plan (SMP), for the Construction Site, precinct or zone clearly illustrating measures to be undertaken to effectively cater for pollutant removal and mitigate soil erosion shall be developed and submitted for approval by the local authority. The SMP shall incorporate;

- pollutant and solid waste removal performance data ;
- percentage of the rainfall on the surfaces of the Construction Site (including roofs), precinct or zone to be treated;
- Details of the components of the treatment system such as bio-basins, vegetated filter strips, sediment traps;
- Percentage and estimated quantity to be captured, stored and used within the site and the percentage to be discharged to the natural water course.
- maintenance requirements of the treatment system

GS4-3-2: Surface-Water Treatment systems incorporating stagnant water are prohibited.

GS4-3-3: The extent of impervious material to all hard landscaping surfaces, including parking spaces and drive ways, shall not be greater than fifty percent (50%) of the total area of hard surfaces.

GS4-3-4: Each zone (Ecological or Urban Management) shall have at least one (1) pollutant and solid waste removal system running parallel to the contours and to the full extent of the zone.

GS4-4: Light Pollution

GS4-4-1: Provision shall be made for adjustable screening devices to openings on the building envelope that are located across any line of site of the lighting fixtures.

GS4-4-2: External lighting levels shall not exceed the minimum requirements for the outdoor environment as stated in the **CIBSE Lighting Guide 6, The Exterior Environment 2016** and shall be designed as to direct light downwards or sideways and prevent illumination of the night-sky.

GS4-4-3: Beam lighting aimed at the night-sky or distant objects within or outside of the Construction Site is prohibited. Façade lighting within the **Ecological Zone** is prohibited.

GS4-5: Waste Management

GS4-5-1: The **Developer** shall submit for approval, by the local authority and prior to commencement of construction, a Waste Management Plan (WMP) incorporating both the construction phase and the operational phase of the development

GS4-5-2: Components of the WMP in each phase shall include;

- Description of different types of waste;
- Monitoring and recording;
- On-site and/or off-site recycling options;
- Institutional as well as the organizational framework for the implementation of the WMP.

GS4-5-3: The WMP shall provide for any hazardous waste to be stored separately, handled and disposed of in accordance with existing legislation and/or the guidelines of the DWMPC.

GS4-5-4: The location of storage of waste shall be fully screened from public view and rain. Where vehicular parking space is provided under the building in accordance with standard GS6-3-4, a portion of that parking shall be reserved for the storage of all the waste generated within the Construction site.

GS4-6: Land-reuse and Reclamation

GS4-6-1:The identification of new land for development within the Ecological Zone shall be supported by a Strategic Environmental Impact Assessment confirming that there is no existing developed land of poor ecological and economic value that can be re-used. Conversely, procurement of virgin land for development shall be based on the determination that the ecological and economic value of such land is not , as a result of such proposed development, being compromised to a level equal or lower than that of the existing alternative.

GS: General Standards



GS 5: Materials



GS5-1: Contaminants and Hazardous Materials

GS5-1-1: Building materials shall have zero content of Volatile Organic Compounds (VOCs), Polychlorinated Biphenyls, Compounds of Zinc, Lead, Asbestos Containing Minerals and Materials.

GS5-1-2: Manufacturer's data bulletin or written confirmation shall be provided guaranteeing that the building product contains safe quantities of formaldehyde in the chemical used.



GS5-2: Local and Regenerative or Ubiquitous Natural Materials

GS5-2-1: The use of local regenerative or ubiquitous natural materials sourced from within the Chobe District is encouraged and may be harvested for use in any development. Such materials shall only be obtained commercially from indigenous or local people licensed to harvest and trade in those materials.

GS: General Standards

GS 6: Transport

GS6-1: Designated Parking for Compact Cars

GS6-1-1: Where it is permitted and subject to restrictions applicable to zones, provision shall be made for exclusive parking for **Compact Cars** at twenty five percent (25%) of total parking requirements. Such parking shall be clearly marked "Compact Cars Only" at the point of entry and equipped with a barrier of a clear height of 1500 mm clearly marked on the barrier. The size of the parking bay shall be 2400mm wide by 4700mm long, and the arrangement of the bays and isle shall be guided by illustrations in the annexure of the Environmental Design Guidelines.

GS6-2: Bicycle Parking

GS6-2-1: Provision shall be made for secure bicycle parking within the **Construction Site** at all developments other than single family residential developments. Mechanisms to securely anchor bicycles to the ground in a vertical position, shall be provided at a ratio of 1 to 10 vehicular parking spaces and at a point nearest to the main entrance of the facility or residential unit.

GS6-3: Parking Location Restrictions

GS6-3-1: Ecological Zone:

Parking at surface may only be located along primary access ways off President Avenue and east and west of the buildings within a maximum distance of thirty (30) metres from the centre line of President Avenue. Parking may be provided under buildings abutting President Avenue with entry and exit points from primary access ways and such that parking is not exposed to view from the inner pedestrian promenade in the Ecological Zone.

GS6-3-2: Urban Management Zone:

Parking at surface may be provided along primary access ways off President Avenue and east and west of the buildings within a maximum distance of fifty (50) metres from the centre line of President Avenue. Additional parking may be provided under buildings abutting President Avenue, with entry and exit points from **Primary Access Ways** and such that parking is not exposed to view from the said avenue.

GS6-3-4: Parking under buildings shall be naturally ventilated and may only be provided by means of a **Cut and Fill** design and not by means of a full basement.

GS6-3-5: Parking is prohibited within the river front and beyond a distance of thirty (30) metres from the centre line of President Avenue.

GS6-4: Amenities

GS6-4-1: Where indicated on the urban design master-plan and as part of the land-use, free or **Pay-Per-Visit** secure and dedicated showers and change rooms, for cyclists and for upkeep by the developer, shall be provided as an integrated part of the development. The amenities shall have benches, showers and water closets at a ratio of one (1) shower, one (1) water closet, one (1) wash hand basin and ten (10) lockers of at least 0.05 m³ to every ten (10) bicycle parking bays or less for each gender.

GS6-4-2: At least one (1) marked taxi parking space for every fifty (50) car parks within the Construction Site shall be provided for commercial developments and civic and community facilities. Taxi parking spaces shall be located at a point near the main entrance of the development and at a distance not exceeding sixty (60) metres from its entrance or hundred (100) metres from the centre line of the **Central Pedestrian Promenade**. The parking bay and access to it shall be well lit and within public view.

GS: General Standards



GS 7: Emissions

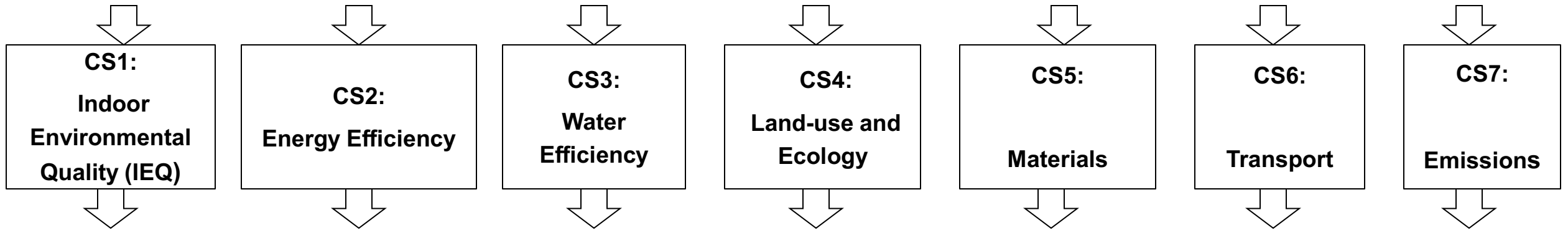


GS 7-1: Restrictions and Other Requirements

GS7-1-1: The use of refrigerants and thermal insulation materials shall conform to international protocols and the recommendations in the CIBSE and ASHRAE standards.

GS7-1-2: There shall be provision in the maintenance plan for regular and scheduled testing for refrigerant leaks. Testing shall be carried out with the prior notification of the local authority and a record of such testing lodged with the authority.

CS : Area Specific Compulsory Standards



CS1-1: As for the whole of the General Standard: GS1

CS2-1: Design for energy efficiency for buildings within the Ecological Zone, or other area as may be determined by the local authority, shall be based on **ASHRAE 90.1 (2013)- Energy Standard for Buildings Except Low Rise Residential Buildings.**

Exceptions to this standard include;

- Pavilion structure;
- Single storey building.

CS2-2 As for the whole of the General Standard GS2 unless otherwise specified under ASHRAE 90.1

CS3-1: As for the whole of the General Standard :GS3

CS4-1: As for the whole of the General Standard GS4

CS4-2: Vegetated Roofs

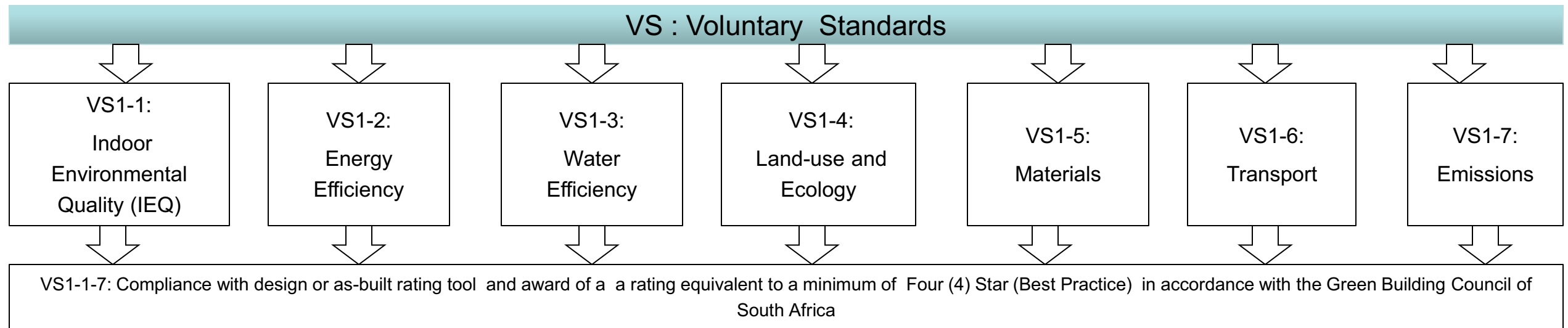
CS4-2-1: All buildings within the Ecological Zone, and other areas as may be determined by the local authority, shall have **Vegetated Roofs** to at least fifty percent (50%) of the roof area or balcony.

CS4-2-2: The last floor of buildings within the Ecological Zone shall be laid out in accordance with Standard GS4-2-4 and so as to ensure good view of the river from external spaces or balconies located at the roof level of the middle floor.

CS5-1: As for The whole of the General Standard: GS5

CS6-1: As for The whole of the General Standard: GS6

CS7-1: As for the whole of the General Standard: GS7



The arrangement of Voluntary Standards is not necessarily uniform and will depend on the choice of the rating tool adopted. In adopting a particular rating tool, the developer shall strictly adhere to the requirements of that rating tool. Other internationally recognized rating tools have been developed by the US Green Building Council: Leadership in Energy and Environmental Design (LEED) and the Green Building Council of Australia (Green Star)

VS2: Natural Ventilation

For buildings with full or partial night occupancy and in close proximity to the river, provision should be made to benefit from the breeze using high level intake openings with wind scoops and low level adjustable vents nearest to the occupied area. For an opening due north, wind scoops should have vertical fins on the west side of the opening. Large projecting canopies acting as sun shading can also be effective as wind scoops over high level inward opening pivoted windows. Roof level pavilions with open sides and mosquito screens should be incorporated as an extension of the indoor space to provide benefit from the breeze.

VS3: Thermal Gradient and Condensation

To control the risk of damage to the structure during periods of high relative humidity, a moisture barrier in the form of a suitable paint or film should be incorporated and applied on the part of the structure where condensation is predicted to occur and on the surface with a Thermal Gradient Temperature higher than Dew-point Temperature.

VS4: Water Recycling and Rainwater Harvesting

To reduce discharge to sewer and for water for non-potable uses, rainwater should be harvested and blended or replenished with recycled water. For easier compliance with public health requirements, building installations for grey water should be separate from black water to enable its collection of treatment more cost-effectively and in line with the quantities required for non-potable uses.

VS5: Net-Zero Power and Net-Zero Water Technologies:

Net -Zero Power should be integrated to facilitate an off-grid development or connection to the grid only as backup. Subject to BPC readiness in terms of feed-in tariff policy and standards, Net-Zero Power should be explored and integrated based on the option to use the grid as storage and in order to mitigate the high and prohibitive costs of off-grid storage associated with renewable solar energy technology.

5.1 GENERAL CIVIL ENGINEERING GUIDELINES

A) INTRODUCTION

This section addresses the civil engineering related issues pertaining to the specific project locations. Specific guidelines have been prepared for 3 catalytic sites. These locations are as indicated below.

- Kazungula Logistics Park.
- Kasane Riverfront Area.
- Kgaphamadi Mixed Use Area.

The Civil Engineering aspects referred to cover the following aspects.

- Bush Clearing and Topsoil Retention.
- Road Network and Vehicular/Pedestrian/Cycle Interactions.
- Storm Water Drainage Network.
- Water Supply.
- Sewer Reticulation.

The following sections will describe in "broad based" terms the various civil engineering aspects that will need to be taken on board for any future detailed designs and final implementation of any works on the ground for the three areas under consideration and they are site specific. Some of the aspects described may be utilized for other areas of Kasane and Kazungula in the future. Detailed Design was not a part of this assignment.

It should be stated at the onset that, all sites that are proposed for development will require detailed topographical surveys and geotechnical surveys. This should be mandatory during the design process and should be undertaken only after the various plots and road servitudes are physically pegged in the ground by the Department of Surveys and Mapping or their appointed Registered Land Surveyor.

An important aspect that also needs careful and accurate consideration is the location and identification of all existing underground and overhead utility services. This is a key component at the onset of any detailed designs for the areas under consideration. This will have an impact on the detailed designs of any proposed infrastructure designs.

The following is a priority listing of key activities that need implementation once the Development Plans are accepted and "frozen" by the client before any detailed engineering designs can commence.

- Cadastral Survey and placement of all plot boundary pegs and demarcation of gazetted road reserves.***
- Topographical Survey of project areas.***
- Geotechnical Survey of project areas.***
- Environmental Impact Assessment (EIA)***
- Archaeological Impact Assessment (AIA)***
- Location and Identification of all underground and above ground utility services.***
- Traffic Counts to be carried out simultaneously at strategic junctions , on at least three days of the week over a 12 hour period. This should also include a "classified" count.***

B) CIVIL ENGINEERING STANDARDS APPLICABLE

The following civil engineering standards are applicable to the detailed design and implementation of the various civil engineering components in the proposed sites as well as other areas in Kasane and Kazungula.

- Urban Development Standards, 1992, Ministry of Local Government.
 - Development Control Code, 1996, Ministry of Local Government and the Department of Town and Regional Planning.
 - Botswana Road Design Manual (BRDM), Ministry of Transport and Communications.
 - Standard Specifications for Road and Bridge Works, Ministry of Transport and Communications.
 - Design Standards, Water Utilities Corporation.
 - Botswana National Wastewater and Sanitation; Planning and Design Manual, Ministry of Environment, Wildlife and Tourism; Department of Sanitation and Waste Management.
- In addition to the above specific civil engineering standards, the following documents should also be referred to during the detailed design and implementation of the various civil engineering components.

TMH 4; Geometric Design Standards for Rural Two-Lane Two-Way Roads.

TRH 4; Structural Design of Flexible Pavements for Interurban and Rural Roads.

Geometric Design Guidelines; South African National Roads Agency Limited.

SABS 1200; Standardized Specifications for Civil Engineering Construction.

Transport in the Urban Environment; The Institution of Highways & Transportation, United Kingdom.

Tables for the Hydraulic Design of Pipes, Sewers and Channels; Volume 1 and 2; HR Wallingford and D.I.H.Barr, Thomas Telford, London, UK.

C) OTHER CIVIL ENGINEERING ASPECTS TO BE INCORPORATED

General

The following civil engineering aspects are relevant to this particular assignment and therefore need to be taken cognisance of during any detailed design stage.

- Road Intersection Spacing
- Channelization of Intersections
- Parking Areas
- Traffic Calming
- Pedestrian and Cyclists Safety

Road Intersection Spacing

In areas where there is existing development it is not possible to comply with the prescribed standards contained in the Botswana Road Design manual pertaining to the spacing of intersections. The spacing of intersections is based on inter alia, the road function and traffic volume. The spacing of intersections impacts significantly on the operation, level of service and the capacity of a roadway. Therefore the prescribed standards in the BRDM play a role in the determination of the location of individual intersections. This is of particular concern when the provision of a new intersection on an existing road is being considered.

The case in point being the accesses proposed from the Kazungula Logistics Park on to the existing Kazungula to the Zimbabwe Border Post Road.

The BRDM specifies the following intersection spacing for various design speeds.

<u>Design Speed (km/h)</u>	<u>Intersection Spacing (m)</u>
50	200
70	300
90	400
120	500

The proposed accesses on to the road to the Zimbabwe Border are in a 60 km/h speed zone. It can be assumed that the traffic will be generally moving at speeds less than 60km/h; say at 50km/h or less as they approach/leave the main intersection given that traffic calming measures are to be introduced on all the main approaches to the main intersections.

Channelization of Intersections

Channelized Intersections should be used when the volume of through traffic, the volume of turning traffic, complexity of turning movements or topographical circumstances are such that an un-channelized intersection will be inadequate.

The purpose of channelization is to achieve safe and efficient operation by managing the anticipated conflicts that are inherent to intersections.

The following are the objectives of good intersection design.

- Reduction of the number of points of conflict to the minimum comparable with efficient operation.
- Reduction of the complexity of conflict areas.
- Limitation of the frequency of actual conflicts
- Limitation of the severity of those conflicts that do occur.

5.2 GENERAL CIVIL ENGINEERING GUIDELINES

To achieve the above objectives, the following principles should be adhered to.

- Vehicle paths should be defined clearly.
- Safe vehicle speeds should be maintained.
- Undesirable or wrong-way movements should be prohibited.
- Channelization should separate points of conflict whenever possible.
- High priority traffic flows should have greater degree of movement.
- Traffic streams should cross at close to right angles and merge at flat angles.
- The design should be in the context of the traffic control scheme.
- Decelerating, slow moving or stopped vehicles should be separated from higher speed through lanes.
- Refuge for pedestrians and the handicapped should be provided where appropriate.

The tools that are available to apply the above objectives are as follows.

- Defining and arranging traffic lanes.
- Traffic islands of various sizes and types.
- Median islands.
- Corner radii.
- Horizontal and vertical approach geometry.
- Pavement tapers and transitions.
- Traffic control devices.

Traffic Calming

The term traffic calming covers a range of traditional and new techniques, designed to reduce the adverse effect of traffic in urban streets. The objective of traffic calming is to achieve safety and environmental targets.

The key objectives of traffic calming include

- Improvement of the environmental quality of streets.
- Improvement of safety and reduction of accidents.
- Improvement in safety and convenience for vulnerable road users. (Including people with impaired mobility, elderly people, pedestrians, children and cyclists).
- Reduction in noise, disturbance and anxiety.
- Restoration of communities divided by speeding traffic.
- Enhancement of the appearance of streets.
- Discouragement of the use of unsuitable routes by heavy vehicles and "through" traffic; ie. minimise streets being used as "rat runs".
- Changes to the attitude of drivers towards speed.
- Tangible demonstration that streets are for people as well as for traffic.

Effective traffic calming measures are made up of a combination of measures. Care must be taken to ensure that the measures used are appropriate to the site and to the defined objectives.

A list of traffic calming measures is listed below.

Speed Bumps – These are typically less than 1.0m in width. To maximise their effect they are made as high as possible; typically between 100 and 200mm. However, these tend to cause damage to vehicles.

Speed Humps – These are typically less than 2.5m in width and approximately 100mm high at the crest of the hump.

Rumble Strips – These are not intended to physically reduce speed and are therefore not particularly effective for traffic calming. They are used to alert the driver to an approach to a hazard. The spacing of the strips is dependent upon the normal operating speed, the reduced speed and the distance from the hazard.

Raised Tables – These are flat topped speed humps with a much larger flat top section to facilitate pedestrian movements and may be combined with any formal pedestrian crossing point.

Raised Intersections – These are a specialised form of raised table applied to the whole area of the intersection.

Thresholds – These are a specialised form of raised table applied to the mouth of an approach road at an intersection to discourage and/or to slow traffic entering a traffic controlled area.

Road Narrowing – Narrowing the road and providing only narrow verges, creates a closed-in appearance which assists in reducing speed.

Chokers – These are local road narrowing's designed to restrict the flow and to a lesser degree, the speed of traffic. They can be one or two lane.

Chicanes – These are artificial bends introduced into the horizontal alignment of a road, or intersection. They primarily reduce speed.

Thumps – These are thermoplastic road humps not less than 900mm wide and 30mm to 40mm high.

Pedestrian and Cyclists Safety

One of the main objectives of traffic calming is to improve conditions for pedestrians and cyclists and also to encourage these modes as alternatives to travel by car. Care is needed in the design of measures, if these objectives are to be achieved.

Wherever possible, the designs should include the following.

Adequate widths and special routes, often giving priority to pedestrian and cyclists.

Central islands and clearly designated crossing arrangements.

Footpaths that maintain the same level at formal pedestrian road crossings, such as flat topped road humps, together with tactile surfaces.

Designated cycle facilities throughout routes and as bypasses at pinch points.

Arrangements to make access for disabled people as easy as possible.

06

KASANE GUIDELINES

- INTRODUCTION
- PRECINCT A
- PRECINCT B
- PRECINCT C

6.1 INTRODUCTION

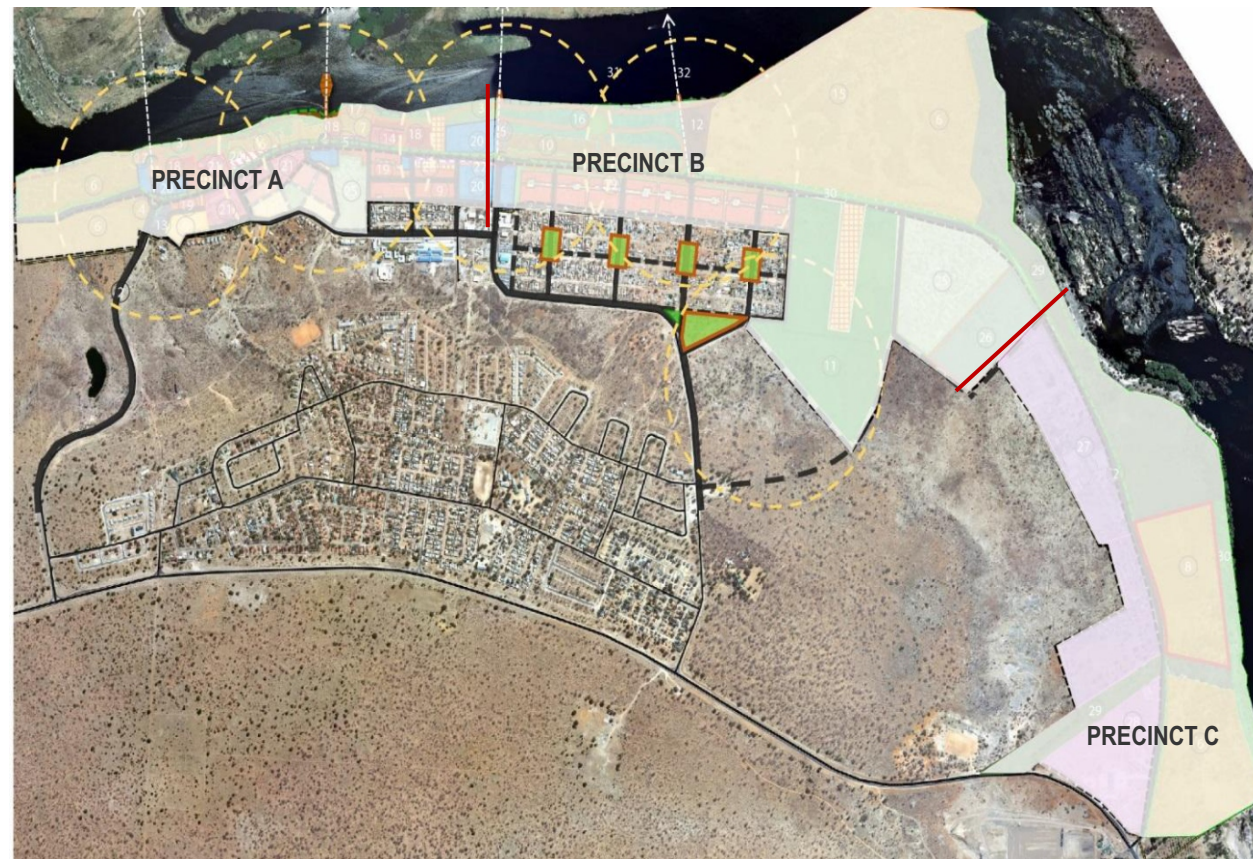
Kasane is envisioned as serving a Town Hub function in the Kasane Kazungula planning area. A town-hub is generally characterised by the creative compact nature of mixed activities that lead to the area being vibrant and efficient. It is also an area of medium to high residential densities with services and facilities that are easily accessible.

Sustainability and Green Design are the basis of this Redevelopment Plan and as a result, these Guidelines and Standards contain a strong high level green design aspect aimed at transforming Kasane to an internationally recognised tourist destination with high regard for green design, sustainability and quality of life.

The Kasane study area has been divided into 3 Precincts, A, B and C. The Guidelines are presented for each precinct and particular attention and graphic illustrations are given for special sites and projects within each precinct.

The Kasane Framework plan that follows on the next page show the proposed land uses for Kasane Redevelopment Plan.

The Planning Matrix (Page 35) illustrates the process of concept development of various solutions and interventions proposed in this manual for Kasane. It summarises issues and the vision brought forward from the Preliminary Design report and hence provides in a succinct manner, the foundation for proposed design concepts and development guidelines.



Locality plan

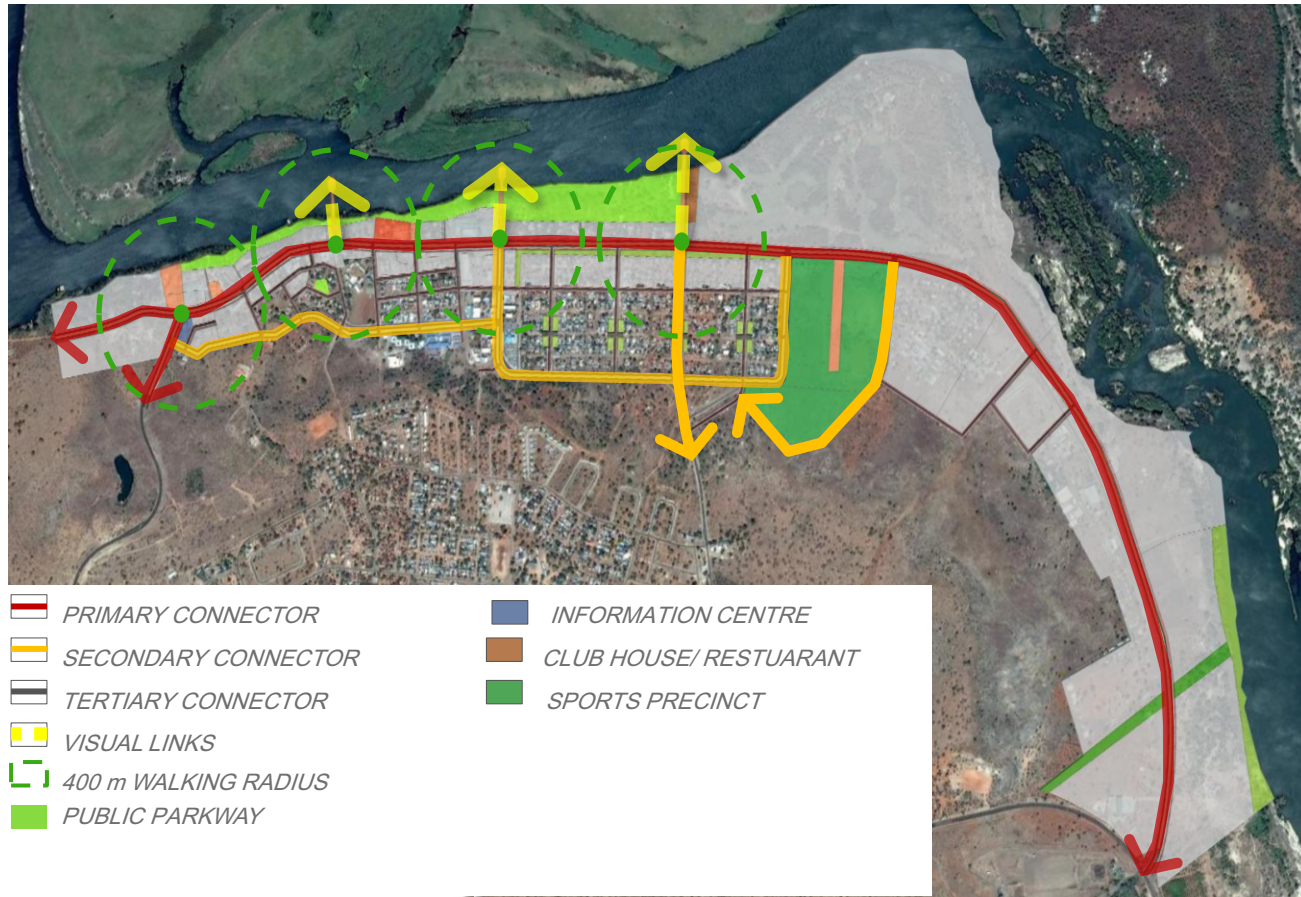


PROPOSED RIVERFRONT
PRECINCT

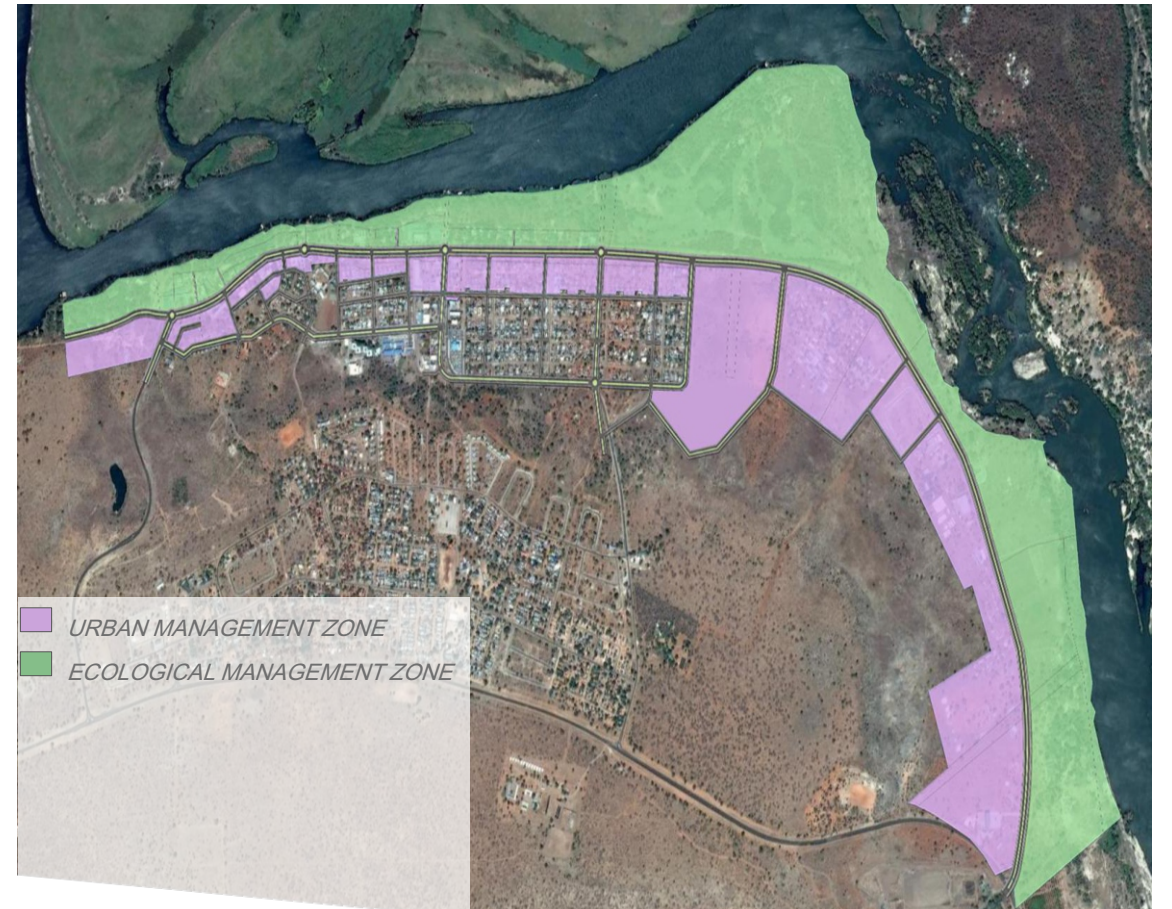
PROPOSED SPORTS
PRECINCT

PROPOSED CONFERENCE
FACILITY

URBAN VISION



MOVEMENT & PUBLIC SPACE



MANAGEMENT OVERLAY

<p style="text-align: center;">PLANNING MATRIX: KASANE</p> <p style="text-align: center;">ROLE - 'The Town Hub':-Travel and Tourism -Commerce,-High Order Institutional and Social Amenities,-Hospitality,-Mixed Residential typologies</p>							
UNIQUE ATTRIBUTES	DEFICITS/ ISSUES	'VISION' THEME	FRAME WORK/ OBJECTIVE	FUNCTIONS/ ACTIVITIES	GENERAL DESIGN PARAMETERS	IDENTIFIED PRECINTS, SITES	AVAILABLE OPTIONS/ POSSIBLE SOLUTIONS
<p>Chobe River front . (Access & Views)</p> <p>Riverine Forest (Ecology)</p> <p>Cultural Heritage</p> <p>Linear Urban Structure (along the river)</p>	<p>Sensitive ecology</p> <p>Need to mitigate impact of Urbanization</p> <p>Need to strengthen Urban Mgt And conservation Structure</p> <p>Poor infrastructure and public services</p>	<p>ECOLOGY & CONSERVATION: NATURE AT ITS BEST.</p>	<p>Protection of flora and fauna</p>	<p>-Tree Planting initiatives/Campaign</p> <p>-Propose Educational Botanical Garden</p>	<p>Manage Pedestrian and limit vehicular access to Ecological zone</p> <p>Very Limited/controlled leisure facilities/structures on the riverine habitat</p>	<p>Precinct A, B and C along the river</p>	<p>-Intensive tree planting along President Avenue (boulevard)</p> <p>-Community driven tree planting in rest of Kasane.</p> <p>-Propose a Botanical Garden at the Community park behind Spar mall in Precinct B</p>
			<p>Human interaction & utilization of flora and fauna</p>	<p>-Boat rides</p> <p>-individual Board walk</p> <p>-passive Viewing</p> <p>-Interactive sessions/rounds</p>	<p>-Manage Degree of public access to the river</p> <p>-Intensity of sustainable non-consumptive Utilization</p> <p>Adequacy, Security and safety of access facilities/modes</p>	<p>Precinct A, B and C along the river</p>	<p>-New viewing decks at Choppies Mall, New Riverfront and behind Spar Mall.</p> <p>-Boardwalk along the river banks.</p> <p>-Opportunity for restaurant/viewing platform on water at Proposed Rivefront precinct A.</p>
			<p>Green Architecture</p>	<p>-Occupational</p> <p>-Productive</p> <p>-Consumptive</p>	<p>-Indoor Environmental Quality</p> <p>-Energy and Water efficiency</p> <p>--Landuse and ecology</p> <p>--materials</p> <p>--Transport</p> <p>--Emissions</p>	<p>Precinct A, B and C.</p>	<p>Varying standards as articulated under environmental design guidelines and assigned for specific sites at Level 3 Design Matrix</p>

PLANNING MATRIX: KASANE
ROLE - 'The Town Hub':-Travel and Tourism -Commerce,-High Order Institutional and Social Amenities,-Hospitality,-Mixed Residential typologies

UNIQUE ATTRIBUTES	DEFICITS/ ISSUES	'VISION' THEME	FRAME WORK/ OBJECTIVE	FUNCTIONS/ ACTIVITIES	GENERAL DESIGN PARAMETERS	IDENTIFIED PRECINTS, SITES	AVAILABLE OPTIONS/ POSSIBLE SOLUTIONS
<p>Chobe River front . (Access & Views)</p> <p>Riverine Forest (Ecology)</p> <p>Cultural Heritage</p> <p>Linear Urban Structure (along the river)</p>	<p>Sensitive ecology</p> <p>Need to mitigate impact of Urbanization</p> <p>Need to strengthen Urban Mgt And conservation Structure</p> <p>Poor infrastructure and public services</p>	<p>CAPITALIZING ON NATURAL ASSET</p>	<p>Connectivity of urban fabric with the river.</p> <p>-public access to River and unique habitats/ riverine forest</p>	<p>Visual, physical access</p> <p>High quality hospitality facilities utilizing river front</p> <p>Recreational Facilities utilizing the river</p>	<p>-Orientation of buildings along the river</p> <p>-extent and mode of visual and physical access to the river, riverine forest and other unique habitats</p> <p>-Typology of architecture along the river front</p>	<p>Precinct A, B and C along the river</p>	<p>-Opportunity for visual and road links to the river at intersections along President Avenue.</p> <p>-Opportunity to introduce special iconic buildings at the river with strong Green architecture at Riverfront site Precinct A and the Hotel and Conference at Precinct C.</p> <p>-Opportunity for a Community recreational park in Precinct B. Park could have Mini Golf, Volleyball Court, leisure areas, Botanical Garden.</p>
		<p>CONTEMPORARY AFRICAN TOWN</p>	<p>-Creation of unique local character that balances contemporary urban features against authenticity of Kasane's heritage.</p> <p>-Declaration and protection of heritage</p>	<p><u>Contemporary</u></p> <p>-Non Motorised Transport</p> <p>-Green Design in buildings</p> <p>-Urban Management structure</p> <p>-Good Health and Social facilities</p> <p><u>Heritage</u></p> <p>-Local Arts and Crafts</p> <p>-Local Artists Public performances</p> <p>-Indigenous Skills in building construction</p> <p>-Wildlife coexistence</p> <p>-Architectural language</p> <p>-Street Art with local artworks and sculptures</p>	<p>-Range of relevant cultural socio-economic activities</p> <p>-form of accommodation of such activities and articulation of settings</p> <p>-Identify key routes that promote NMT</p> <p>-Establish an authority that will manage all aspects all Urban aspects of the town: (Infrastructure and Facilities design and maintenance, Street upkeep, public safety, waste management, re-use, recycling etc.)</p>	<p>Precinct A, B and C.</p>	<p>-Promote NMT along President Avenue. (separate cycling and pedestrian lanes plus a Bus system)</p> <p>-Provide Arts and Crafts stalls at strategic locations along President Avenue. With iconic architectural structures.</p> <p>-Provide Amphitheatres and public spaces for public performances</p> <p>-Identify precinct where indigenous building skills could be interpreted in defining architectural language of some buildings. (Museum, Sports Precinct)</p> <p>-Strategic locations for Street Art along President Avenue</p>

PLANNING MATRIX: KASANE
ROLE - ‘The Town Hub’:-Travel and Tourism -Commerce,-High Order Institutional and Social Amenities,-Hospitality,-Mixed Residential typologies

UNIQUE ATTRIBUTES	DEFICITS/ ISSUES	‘VISION’ THEME	FRAME WORK/ OBJECTIVE	FUNCTIONS/ ACTIVITIES	GENERAL DESIGN PARAMETERS	IDENTIFIED PRECINTS, SITES	AVAILABLE OPTIONS/ POSSIBLE SOLUTIONS
Chobe River front . (Access & Views) Riverine Forest (Ecology) Cultural Heritage Linear Urban Structure (along the river)	Sensitive ecology Need to mitigate impact of Urbanization Need to strengthen Urban Mgt And conservation Structure Poor infrastructure and public services	COMMUNITY AT THE HEART	Economic empowerment of locals: involvement in the supply chain, and service sector	-Trade in material culture- artifacts, performing arts, Cuisine, transportation of tourists; Edu-tourism- etc -Active participation of Community groups in the development or construction of certain iconic structures that resonates pride in the community -Continuous participation of community groups in the urban management of Kasane. (facilities maintenance, green and clean campaigns/projects)	Nature, extent and location of trade pavilions, Exhibition spaces, food outlets, information and edu-tourism facilities Instill a strong element of community empowerment in the continuous Urban Management Model for Kasane.	Precinct A, B and C.	-Provide Arts and Crafts stalls at strategic locations along President Avenue. With iconic architectural structures. -Provide Amphitheatres and public spaces for public performances -The new NMT bus system could have a strong community ownership through the local taxi industry. -The Interpretation Museum in Precinct A and the Sports Facility in Precinct B are opportunities to explore a model of Community led participation. In their development.
		GLOBAL POSITIONING	-Place Branding (Differentiation) -Attract international recognition for efforts/deeds -Accessibility -Tourism Offerings, -promotion of eco-tourism and edu-tourism	-Green and Clean initiatives with strong and efficient Urban management structure. -Green Design -Efficient movement network linking the airport and the town.	Establish a well resourced Green and Clean authority to initiate community Green projects/campaign in Kasane -Identify key routes that promote NMT -Signature and landmark architecture. -Character of selected mode of transport to promote image of an efficient town and for suitable Connectivity between precincts and districts	Precinct A, B and C.	

6.2 PRECINCT A


PRECINCT 'A' GENERAL ETHOS

This precinct is the most vibrant and lively in Kasane due to the diversity of uses concentrated within the precinct. A high level of urban design intervention is planned to transform it to a pleasant urban atmosphere. Locals and tourists are able to interact in a compact pleasant setting through trade, leisure and service. The area is considered a catalyst for development and is

proposed as a short-medium term development priority to kick-start redevelopment of Kasane.

Emphasis has been placed on green design guidelines for new buildings, promotion of non-motorised transport and the redesign of the plots layout to create a more compact, vibrant and efficient street edge along President Avenue. The Riverfront precinct in particular now activates community access to the river and hence creates tourism economic opportunities.

PRECINCT 'A' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES				ILLUSTRATION
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) GUIDELINES NOTES	
Warthog Park	<p><u>Maximum 2 storey (7 metres ground floor to top ceiling)</u> Obstruction will be a consideration.</p>	<p>FRONT - No setback requirement. Build to Plot Line.</p>	<p>1 bay per 40m²</p>	<p>a) Board walk & deck (suspended) The proposed riverside walkway will start here at the Warthog's Park. An information sign with maps and facts could be arranged where it starts.</p> <p>b) Curio shops/ market along the walk way Since most of the proposed activities would be concentrated around the same areas, it was considered beneficial to have small traders tapping on that opportunity by way of making provision for smaller kiosks along the proposed walk way. The same would also cater for scheduled market days where different traders would showcase their products and possibly benefit from the huge presence of potential customers.</p> <p>c) Pick and Drop spot A proposal is made to have a taxi pick and drop point around this project area to cater for the transportation needs of the public.</p> <p>d) Entrance point When arriving in Kasane, a view to the river could be opened up and the area around the junction could be enhanced to emphasise the entrance.</p>	 <p>Proposal of possible development</p>

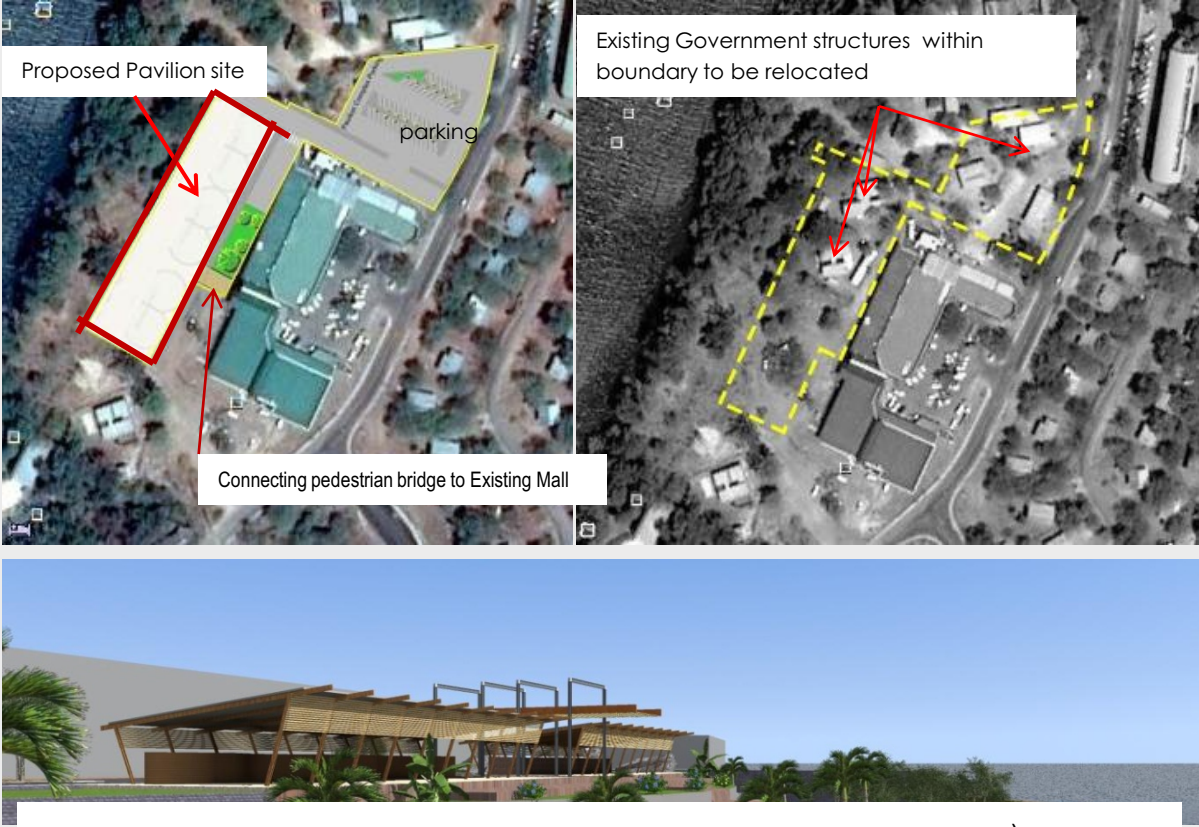
Applicable Environmental Design Standards

This development is recommended for Voluntary Environmental Design Standard equivalent to a minimum of Four (4) Star (Best Practice) in accordance with the Green Building Council of South Africa. The following Voluntary standards or better shall be applicable to this development (refer voluntary standards section for details):

VS2: Natural Ventilation; **VS3:** Thermal Gradient and Condensation ;**VS4:** Water Recycling and Rainwater Harvesting; **VS5:** Net-Zero Power and Net-Zero Water Technologies

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
<p>GS1: All General Standards under GS1 shall be applicable to this development</p>	<p>GS2: All General Standards under GS2 shall be applicable to this development</p>	<p>GS3: All General Standards under GS3 shall be applicable to this development</p>	<p>GS4: All General Standards under GS4 shall be applicable to this development</p>	<p>GS5: All General Standards under GS4 shall be applicable to this development</p>	<p>GS6: All General Standards under GS4 shall be applicable to this development</p>	<p>GS7: All General Standards under GS4 shall be applicable to this development</p>

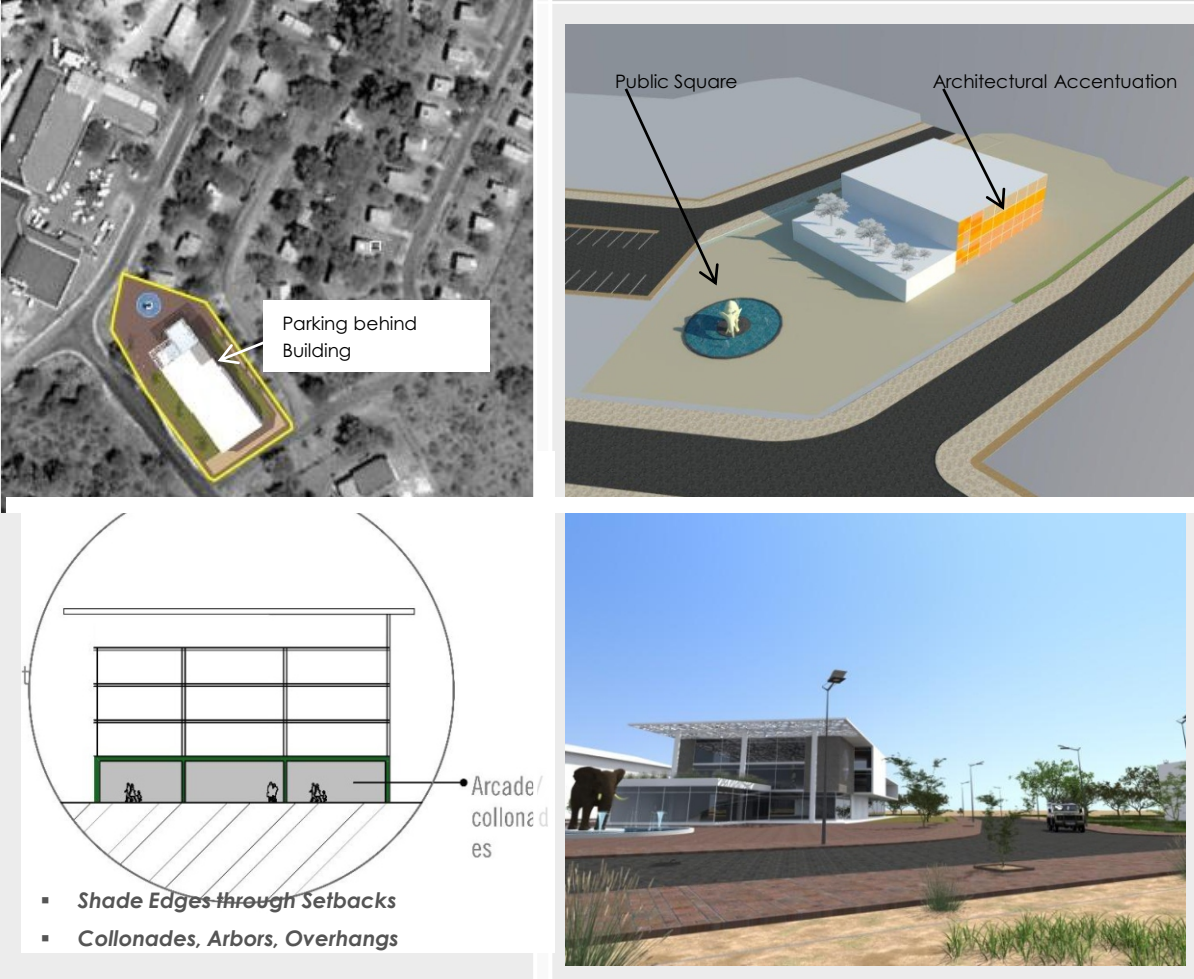
PRECINCT 'A' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES				ILLUSTRATION
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) GUIDELINES NOTES	
<p>Pavilion Leisure site behind Waterfront Mall (Choppies)</p>	<p>Maximum 2 storey (7 metres ground floor to top ceiling) Obstruction will be a consideration.</p>	<p>FRONT - No setback requirement. Build to Plot Line.</p>	<p>1 bay per 40m²</p>	<p>i. A leisure site meant to promote interaction with the river behind Watergate mall ii. The development shall be Pavilion structures built from indigenous construction materials iii. It is a single Site and shall be developed by one developer with possibility for multiple tenancy iv. The site is on a 1 in 50 year flood plain. It is therefore recommended that the structure shall be on raised deck above the 50 year flood level. Refer to Chapter 5.1.2 (5) Response to slope towards the river</p>	 <p>The illustration consists of two aerial site plan images and a 3D architectural rendering. The top-left aerial image shows the 'Proposed Pavilion site' outlined in red, with a 'parking' area nearby. The top-right aerial image shows 'Existing Government structures within boundary to be relocated' outlined in yellow. A 'Connecting pedestrian bridge to Existing Mall' is also indicated. The bottom image is a 3D rendering of the Pavilion structure, a long, low-profile building with a wide, overhanging roof supported by wooden posts, situated behind a waterfront area.</p>

Applicable Environmental Design Standards

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
<p>GS1: All General Standards under GS1 shall be applicable to this development</p>	<p>GS2: All General Standards under GS2 shall be applicable to this development</p>	<p>GS3: All General Standards under GS3 shall be applicable to this development</p>	<p>GS4: All General Standards under GS4 shall be applicable to this development</p>	<p>GS5: All General Standards under GS4 shall be applicable to this development</p>	<p>GS6: All General Standards under GS4 shall be applicable to this development</p>	<p>GS7: All General Standards under GS4 shall be applicable to this development</p>

PRECINCT 'A' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES				ILLUSTRATION
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) GUIDELINES NOTES	
<p><u>Information Centre Museum</u></p>	<p>Maximum 3 storey (10 metres ground floor to top ceiling) Obstruction will be a consideration.</p>	<p>FRONT - No setback requirement. Build to Plot Line. SIDE and REAR - No setback requirement. Build to Plot Line.</p>	<p>3 bays per 100m² Parking should be provided behind the Building, NOT along the Airport Road.</p>	<p>i. An iconic Public building of Contemporary architecture that promotes indigenous building materials and skills. ii. It is recommended that the building should target 'Voluntary Standard' as articulated in chapter 5.2 Environmental Design Guidelines in an effort to promote the Green and Clean agenda of Kasane Kazungula Redevelopment Plan. iii. Refer to Design palette at section 8 for indication of preferred design texture, material and colour. iv. Provide roof garden with unobstructed views to the Chobe river.</p>	 <p>The illustration includes three parts: 1) An aerial site plan showing a yellow-outlined building footprint with a callout 'Parking behind Building'. 2) A 3D architectural rendering of the building with a 'Public Square' in front and 'Architectural Accentuation' on the facade. 3) A circular cross-section diagram of an 'Arcade/collonnades' showing a shaded walkway with a callout 'Shade Edges through Setbacks' and a list: 'Collonades, Arbors, Overhangs'.</p>

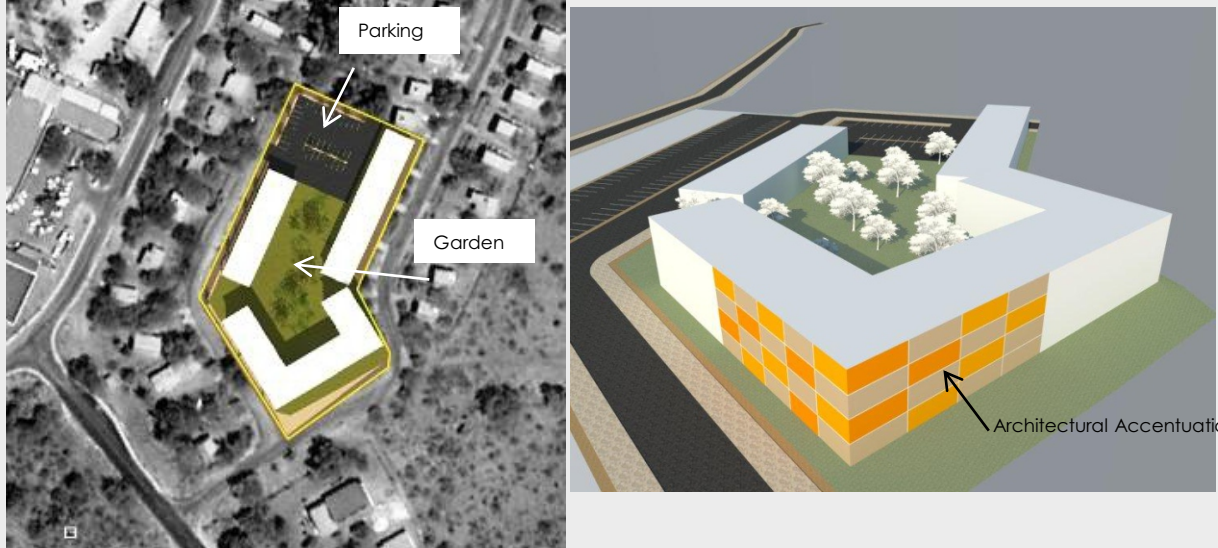
Applicable Environmental Design Standards

This development is recommended for Voluntary Environmental Design Standard equivalent to a minimum of Four (4) Star (Best Practice) in accordance with the Green Building Council of South Africa
The following Voluntary standards or better shall be applicable to this development (refer voluntary standards section for details):

VS2: Natural Ventilation; **VS3:** Thermal Gradient and Condensation; **VS4:** Water Recycling and Rainwater Harvesting; **VS5:** Net-Zero Power and Net-Zero Water Technologies

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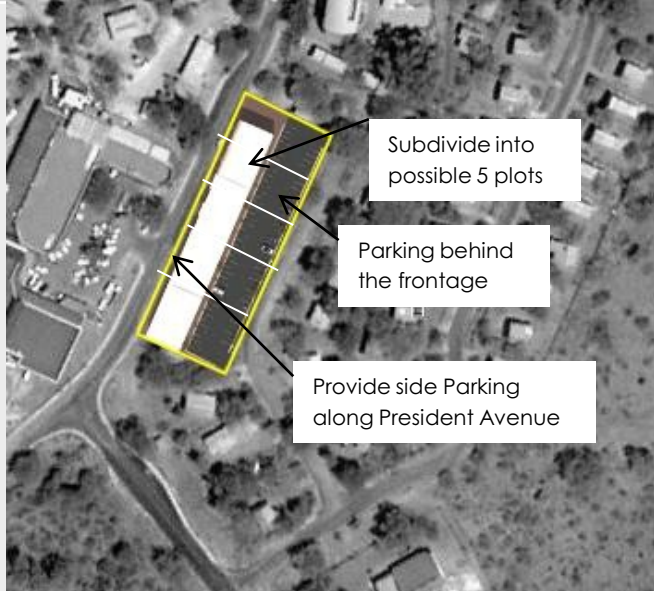
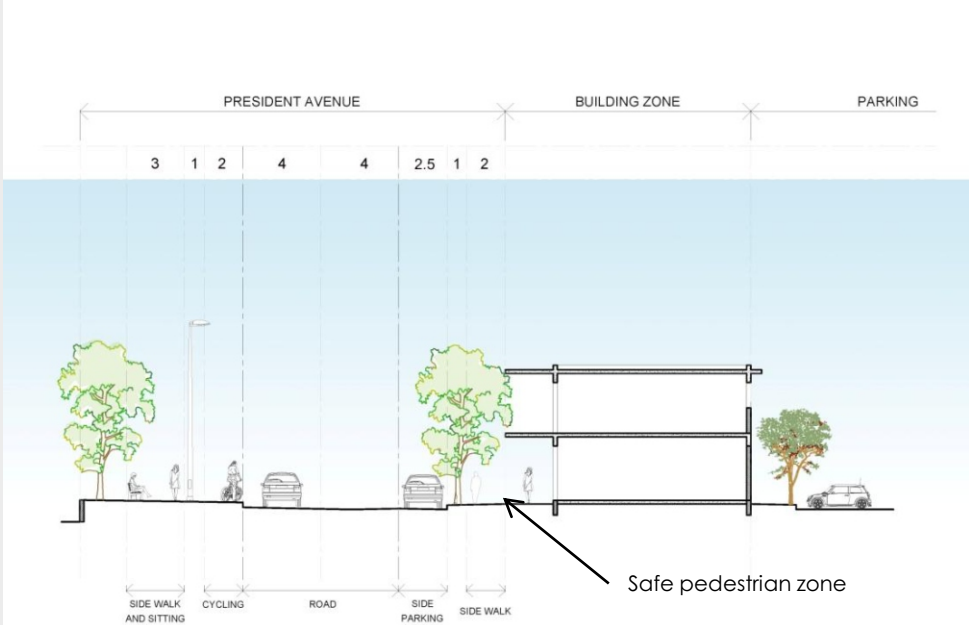

PRECINCT 'A' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES				ILLUSTRATION
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) GUIDELINES NOTES	
<p><u>Residential Middle-High Density</u></p>	<p><u>Maximum 3 storey (10 metres ground floor to top ceiling)</u> <u>Obstruction will be a consideration.</u></p>	<p>FRONT – 5metres SIDE and REAR – 1.5metres</p>	<p>1 bay per Unit</p>	<p>i) As a public building, development shall strictly follow environmental design standards in this manual to champion Kasane's vision of a 'green and clean' destination. ii) Refer to Design palette at section 8 for indication of preferred design texture, material and colour.</p>	

Applicable Environmental Design Standards

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
<p>GS1: All General Standards under GS1 shall be applicable to this development</p>	<p>GS2: All General Standards under GS2 shall be applicable to this development</p>	<p>GS3: All General Standards under GS3 shall be applicable to this development</p>	<p>GS4: All General Standards under GS4 shall be applicable to this development</p>	<p>GS5: All General Standards under GS4 shall be applicable to this development</p>	<p>GS6: All General Standards under GS4 shall be applicable to this development</p>	<p>GS7: All General Standards under GS4 shall be applicable to this development</p>

PRECINCT 'A' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES				ILLUSTRATION
<p>Mixed Use (Retail, Office, Residential)</p>	<p>A) BUILDING HEIGHT LIMIT Maximum 2 storey (7 metres ground floor to top ceiling). Obstruction will be a consideration.</p>	<p>B) BUILDING SETBACKS FRONT - No setback requirement. Build to Plot Line. SIDE and REAR - 1.5metres</p>	<p>C) PARKING REQUIREMENTS Commercial and Retail – 1 bay per 40m² Residential – 1 bay per Unit</p>	<p>D) GUIDELINES NOTES i. Façade treatment of the front of the buildings should demonstrate strict adherence to the adopted design palette at section 8 ii. Side parking shall be provided in front of the buildings on President Avenue. iii. Rest of Parking provided at the back of the buildings.</p>	  

Applicable Environmental Design Standards

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
<p>GS1: All General Standards under GS1 shall be applicable to this development</p>	<p>GS2: All General Standards under GS2 shall be applicable to this development</p>	<p>GS3: All General Standards under GS3 shall be applicable to this development</p>	<p>GS4: All General Standards under GS4 shall be applicable to this development</p>	<p>GS5: All General Standards under GS4 shall be applicable to this development</p>	<p>GS6: All General Standards under GS4 shall be applicable to this development</p>	<p>GS7: All General Standards under GS4 shall be applicable to this development</p>


PRECINCT 'A' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES			
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) GUIDELINES NOTES
<p>Government Precinct - Existing Landboard Building</p>	<p>As existing</p>	<p>As existing</p>	<p>1 bay per 40m²</p>	<ul style="list-style-type: none"> i. The existing Landboard building shall be retrofitted to suit the adopted building character of Kasane under this project. ii. The use of the building shall remain with Chobe Landboard or any other appropriate government department. iii. Treatment of the external façade shall have architectural accentuation that introduces aspects of the design palette as presented at chapter 8 of this manual. iv. As much as possible the Environmental Design standards shall be applied during retrofitting to improve the performance of the building from an environmental design point of view. v. In light of the above, it is highly recommended that a specialist assignment should be commissioned to do an inventory of the Landboard building and recommend technical and architectural retrofitting to suit adopted general guidelines and design palette. vi. The rest of the small government buildings around the land board building shall be demolished and their plots consolidated into garden and public area around what will be an iconic Landboard building.

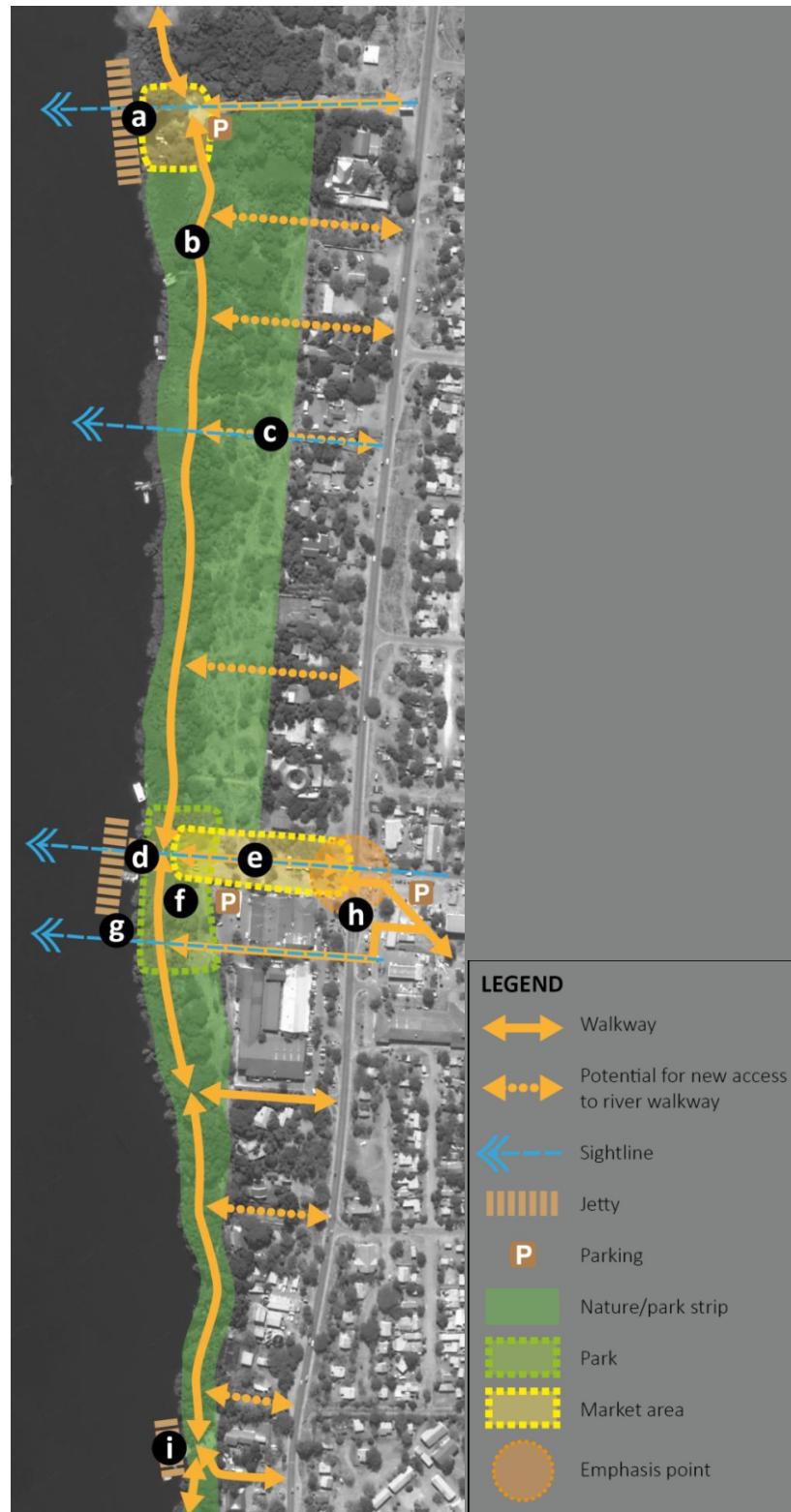
Applicable Environmental Design Standards

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
<p>GS1: All General Standards under GS1 shall be applicable to this development</p>	<p>GS2: All General Standards under GS2 shall be applicable to this development</p> <p>CS2-1: Design for energy efficiency for buildings within the Ecological Zone shall be based on ASHRAE 90.1 (2013)- Energy Standard for.</p>	<p>GS3: All General Standards under GS3 shall be applicable to this development</p>	<p>GS4: All General Standards under GS4 shall be applicable to this development</p>	<p>GS5: All General Standards under GS4 shall be applicable to this development</p>	<p>GS6: All General Standards under GS4 shall be applicable to this development</p>	<p>GS7: All General Standards under GS4 shall be applicable to this development</p>

PRECINCT 'A' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES				ILLUSTRATION
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) GUIDELINES NOTES	
<p>Traders Zone <u>Located in front of Chobe Marina Lodge</u></p>	<p><u>Maximum 1 storey</u></p>	<p>Not applicable</p>	<p>Not applicable</p>	<p>i. Contemporary designed roof structure along President Avenue to accommodate street traders. ii. There shall be public ablution facilities provided in the vicinity of the Traders zone iii. There shall be bicycle pods provided in the vicinity of the site</p>	 <p>Illustration of Traders Market along President Avenue</p>

6.2 PRECINCT B



Precinct 'B' is characterised by Mixed use (Retail,Office/Residential),Lodges accommodation and a large public park. The precinct provides a slightly different character and feel when compared to precinct A in that the concentration and intensity of uses and activities begins to reduce as there are less commercial and civic uses being proposed in this area.

In keeping with the theme of capitalising on the river as well as the idea of keeping the community at heart, a Public parkway is proposed behind the lodges. It is envisioned tourists.

Another key proposal in this precinct is the sports precinct that is aimed at serving the local community by providing the facilities for various sports codes.

a) Public jetties

The area behind Hunter Africa Mall is more central and is frequented by a lot of people in comparison with other project areas. Most smaller boat operators use this spot though it is not developed and this exposes their customers to a lot of risks and it also contributes a lot to the degradation of the area.

A proposal was therefore made to have three public jetties that would benefit all. The Jetties will allowing for proper management of the area and reduce their environmental impact.

b) Recreational park with fishing spot

A recreational park would be where residents and visitors could go and engage in different forms of recreation for their entertainment.

c) Linking passages / access points

There is a possibility to open up a walkways connecting President's Avenue and the Riverfront acting as access points and linking the Kasane residential area and the river.

d) Market area

Since most of the proposed activities would attract many people to the area, it was considered beneficial to have small traders tapping on that opportunity by way of making provision for smaller kiosks along the proposed access routes/ passages.

e) Floating barbecue

There has been a proposal of providing a floating barbecue to offer customers the experience of outdoor braai sessions afloat the Chobe River.

f) Outdoor gym

The need for exercising to stay healthy has been demonstrated adequately by groups of people as well as individuals who have been observed jogging, walking or aerobics along the road which to some extent is hindered by the movement of wild animals. An outdoor gym, secured would be highly beneficial to the residents.

The proposals are subject to feasibility studies.

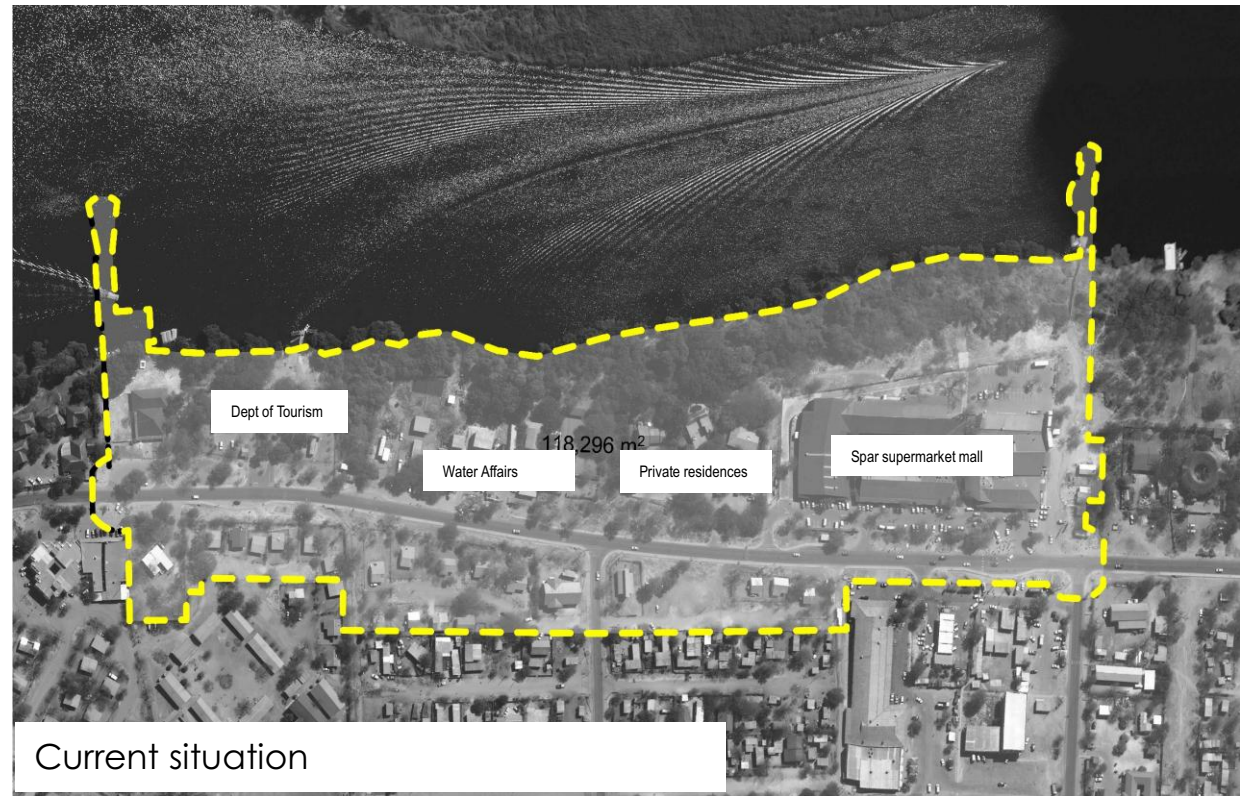
KASANE RIVERFRONT DEVELOPMENT GUIDELINES

The Riverfront Precinct is an attractive and interactive public space meant to foster tourism business by bringing together a mix of compatible commercial and leisure related activities. Currently Water Affairs, Dept of Tourism, Immigration offices and two private residences are located in this area.

The proposal contains boutique hotel, restaurants, urban spaces, retail offices mixed use etc. The restaurant/s will serve a diversity of new activities in the riverfront. Some of the symbolic Water Utilities Corporation structures could be reused as heritage to design the new restaurant/s around them.

The boutique hotel is a Middle to up-market business hotel located in a vibrant new mixed use development containing specialty restaurants, amphitheatre, viewing decks. Scale and architecture of buildings to be responsive to ecological sensitivity of the zone as per the adopted green design standards.

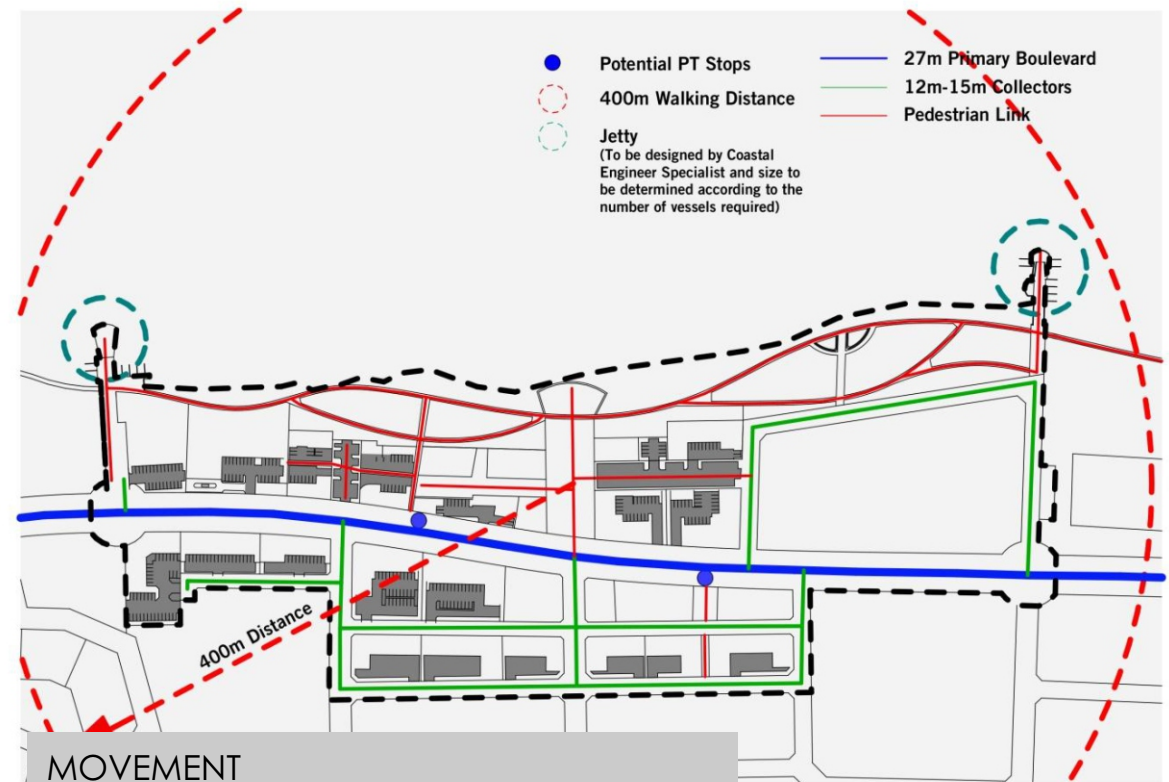
The application of Botswana Tourism Organization's *Ecotourism Certification system – Accommodation Standards and Ecotourism Best Practices Manual* will be applicable for the Hotel development.



Current situation

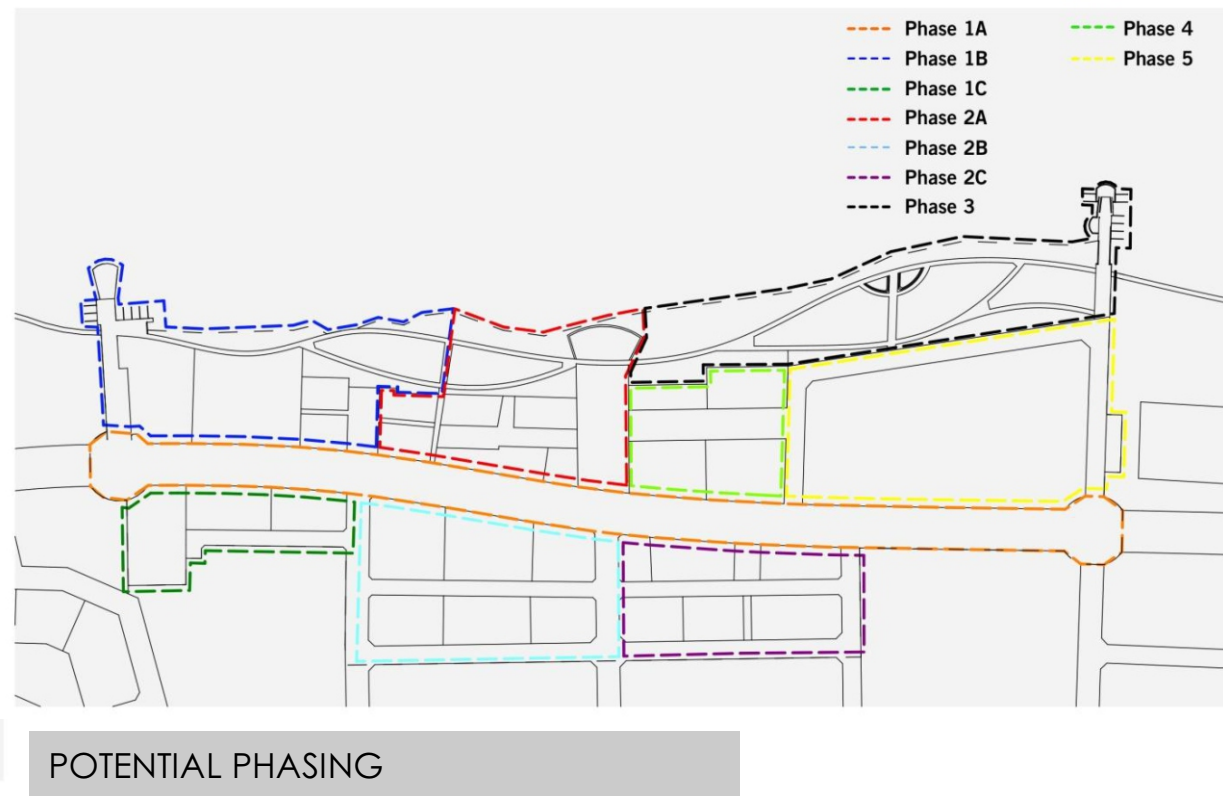
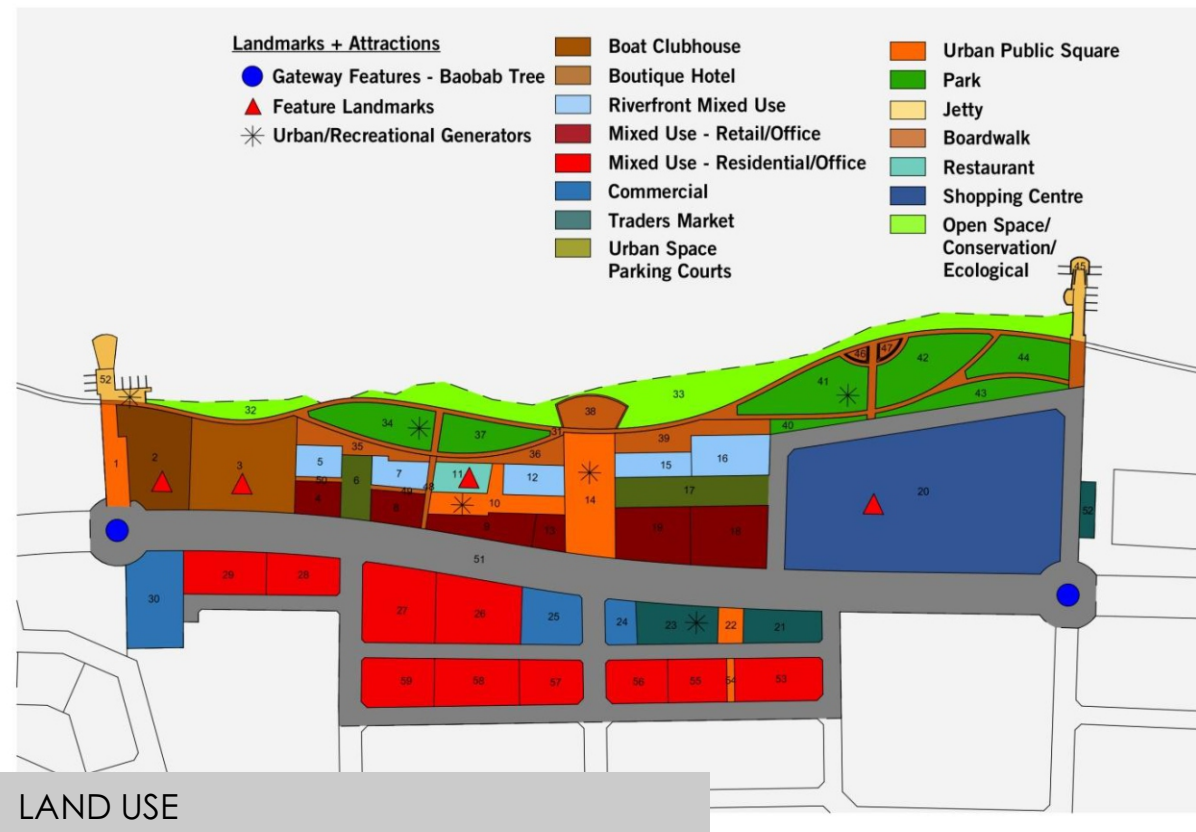
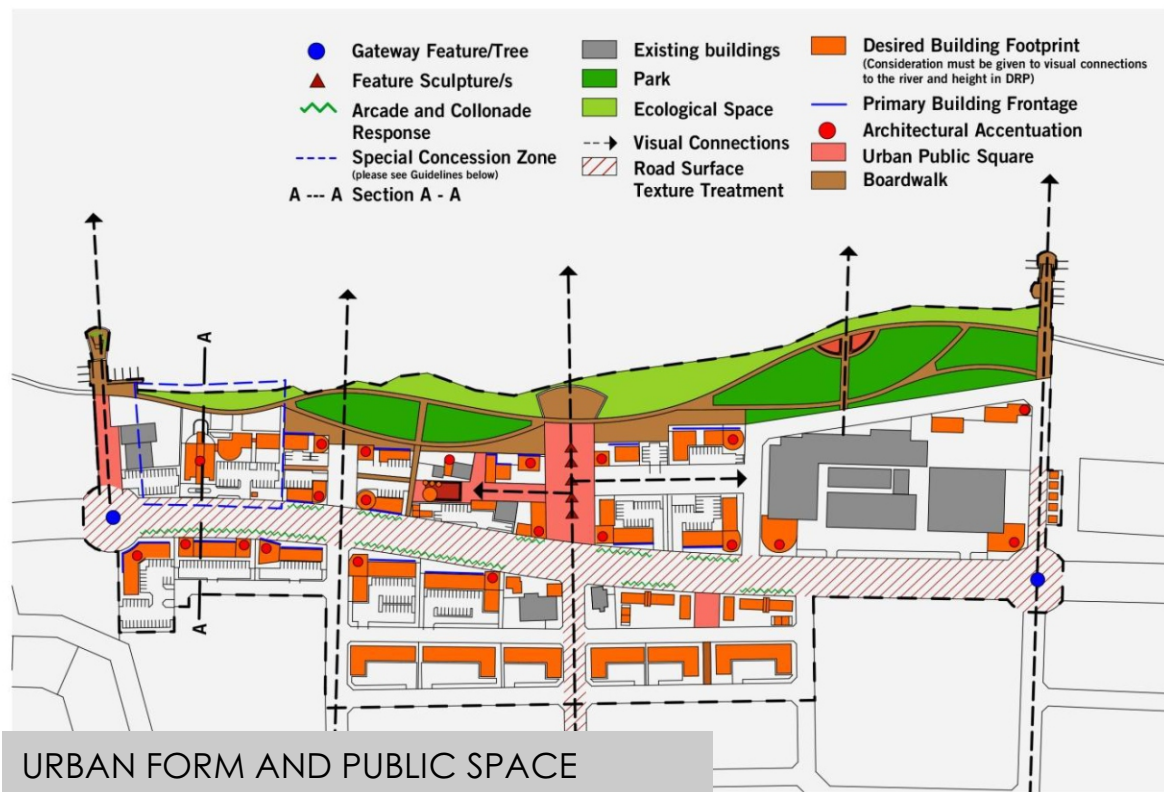


SUBDIVISION



MOVEMENT

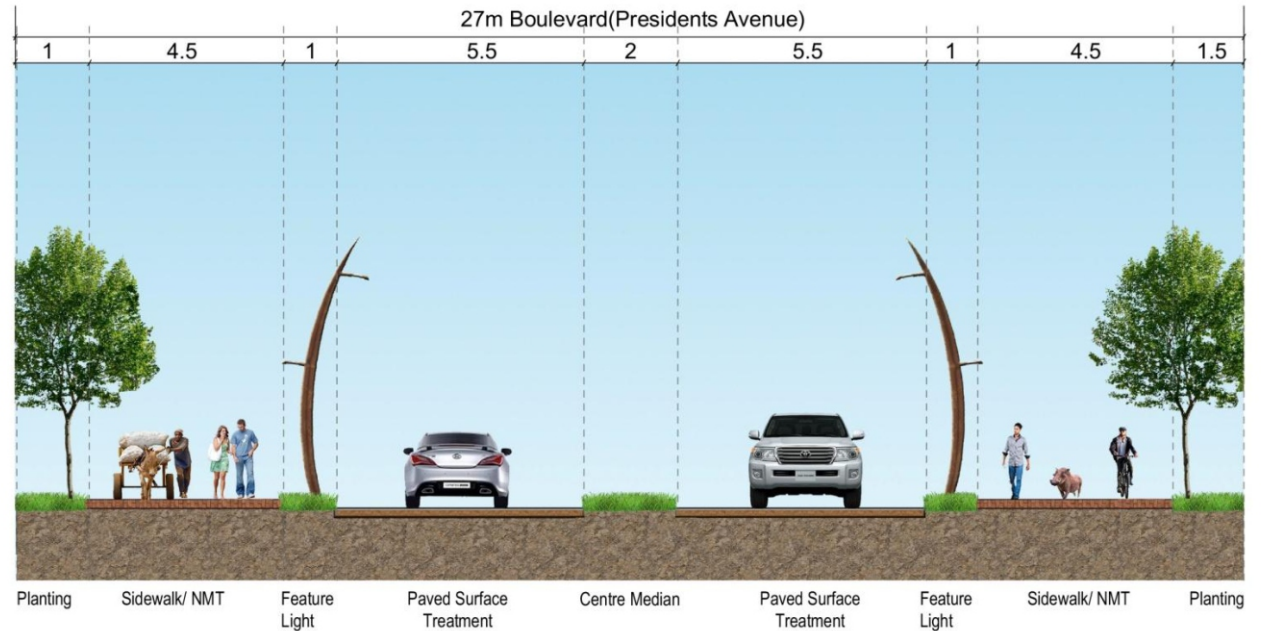
KASANE RIVERFRONT DEVELOPMENT GUIDELINES



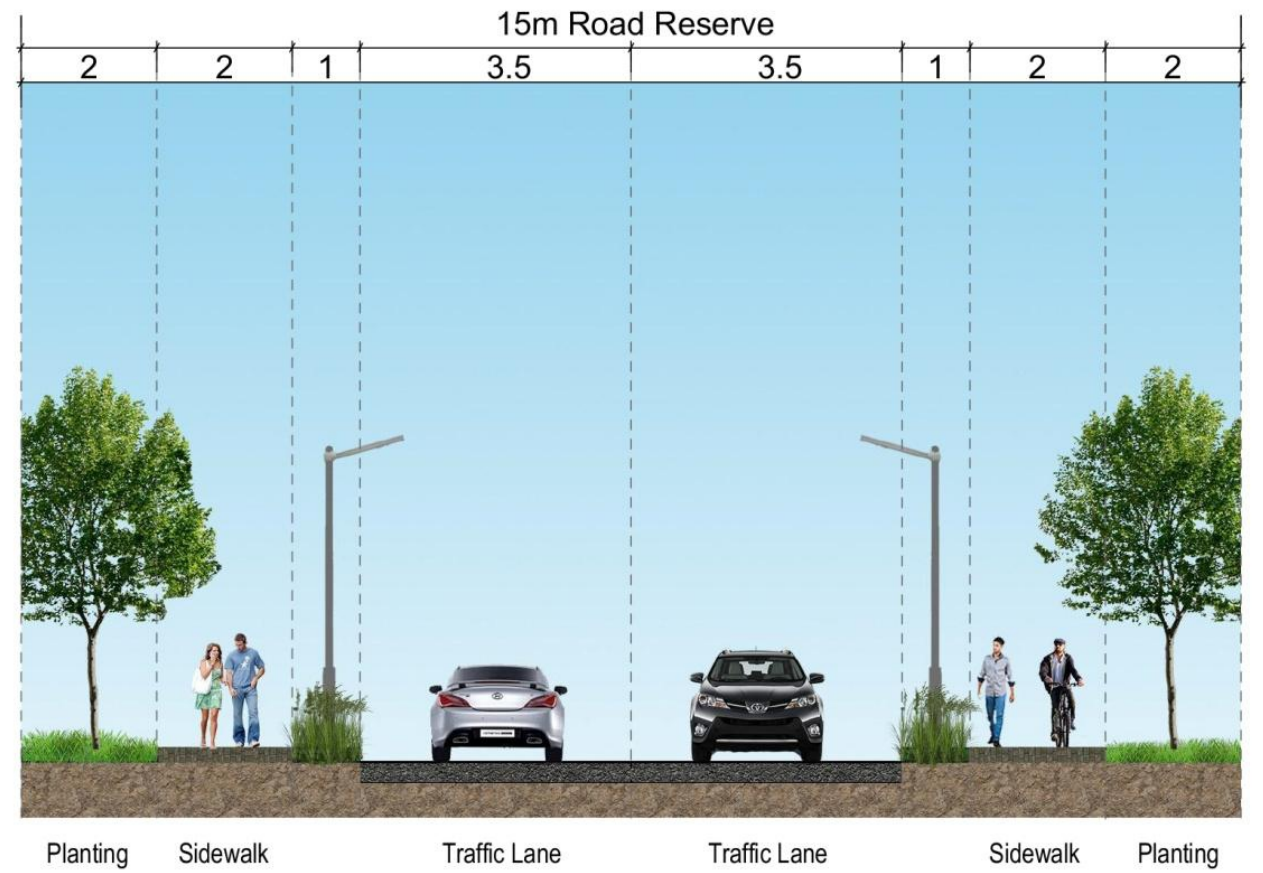
KASANE RIVERFRONT DEVELOPMENT GUIDELINES



Transforming a road into an Urban Boulevard - Shared Street



Cultural experience - Riverfront Restaurant + Stage



Collection of People - Main Urban Riverfront Square

KASANE RIVERFRONT CIVIL ENGINEERING GUIDELINES

A) General

This area is demarcated by Presidents Drive to the south, the Chobe River to the north, Chobe Marina Lodge to the west and the Spar Complex to the east. The ground fall is from Presidents Drive to the edge of the Chobe River. The fall is approximately 10 to 15m from Presidents Drive to the waterfront across the project area under consideration.

B) Bush Clearing and Topsoil Retention

Since the area under consideration is already built up except for those areas which are very close to the river bank, very little bush clearing is envisaged. However all large trees (say a girth of more than 1m) should be retained. The following aspects have to be put in place to safe guard the site.

Whilst the initial topographical survey of the site is being carried out, all large trees (say a girth of more than 1m) will have to be identified and surveyed.

- i. These identified large trees will need to be physically marked on site and the contract documents prepared should clearly state the penalty for the destruction of such marked trees.
- ii. Should there be the need to modify slightly any road alignments or service alignments due to the presence of these large trees, then the designs should be flexible to accommodate these minor changes.
- iii. All trees that are eventually cleared for the development areas should be cut and stacked in to suitable lengths (say 400mm) for the use by the local residents.
- iv. The removal of topsoil should be kept to a bare minimum, say 150mm in depth. It should be stockpiled in a neat manner for later re-use for landscaping.

C) Road Network and Vehicular/Pedestrian/Cyclist Interactions

The road network within the project area needs to take into account the facilities for pedestrians and cyclists that are envisaged.

The following aspects need to be taken cognisance of during the design and implementation stages.

a) The road reserve width along this section of Presidents Avenue should be clearly set out. This will enable the council to remove any unauthorised signage from within the road reserve.

b) The horizontal alignment of President Avenue along this section may require slight modification to suit any proposed cross section which allows for cycle paths in the future.

c) There are five major intersections along this portion of the road that will need special treatment to make the area more attractive and safe at the same time for all road users. They are as follows.

The proposed new roundabout near Chobe Marina Lodge.

The proposed new roundabout near the Spar Complex.

The three 'T' Junctions in between the two roundabouts mentioned above.

d) It is recommended that the existing vertical alignment be modified slightly to be able to tie into and accommodate the above five locations. In addition the existing surfacing of the road be re-cycled with the existing base layer and re-laid since this portion of the road is badly deformed with quite extensive edge damage and carriageway damage. This should be done after treating the underlying sub base material to conform to normal specifications.

e) The recommended treatment of the road should comply with the Botswana Road Design Manual and relevant specifications for bulk earthworks, selected sub grade, sub base, base and surfacing. In general they are as listed below.

Bulk Earthworks; compacted to 90% MOD AASHTO density; CBR = 3%

Selected Sub Grade; compacted to 93% MOD AASHTO density; CBR = 15%

Sub Base; compacted to 95% MOD AASHTO density; CBR = 45%

Base; compacted to 98% MOD AASHTO density; CBR = 80%

f) It is recommended that the two roundabouts are configured in the shape of an "inverted saucer" instead of in the conventional manner. This eliminates the need for cross drainage from the inside kerb of the roundabout to the outside kerb of the roundabout beneath the paved surface. This completely eliminates situations where the roundabout gets flooded during storms due to blocked underground cross drainage and eliminates the need for maintenance

. This can be achieved as the traffic speed round the roundabout is much reduced than the 60kmph speed limit although the carriageway round the roundabout will be at a reverse camber for a very short distance. This philosophy has been used successfully in the past in Lobatse.

g) The paving recommended for the five special locations is 80 mm thick, 30 Mpa Interlocking Pavers laid on a 30mm bed of river sand after the preparation of the Bulk Earthworks, Selected Sub Grade, Sub Base and the Base to the prescribed standards as recommended by the latest Botswana

Roads Department Design Manual. The pavers should be red in colour as it will warn traffic of a roundabout/junction and will also accommodate the turning movements and the braking.

h) All junctions within the project area should be controlled by either "4 way" or "3 way" STOP Signs. This is by far the safest mode of traffic control for the project area. Traffic lights are not warranted given the traffic volumes.

i) All pedestrian crossings should be raised at least 100mm above the finished road level and be at least 2m wide and be constructed of Interlocking Block Paving, red in colour. This will then act as a traffic calming measure and will also alert the driver to the need to reduce speed when approaching the pedestrian crossing point.

j) The internal paved areas in the project area should ideally comprise of the following :

Bulk Earthworks

Selected Sub Grade

Sub Base

Interlocking Paving/Paving Slabs/Paving Bricks

k) It is preferable that, naturally occurring gravels that comply with the Roads Department Specifications are used for the bulk earthworks, selected sub grade, sub base and the base.

l) There are options available for the surfacing of the roads. These are a double seal surfacing, a cape seal, pre mix asphalt or interlocking block paving. The choice will be dependent upon the capital cost, maintenance cost and the location of its use. It is recommended that Presidents Avenue be treated with a pre mix asphalt surface.

m) Any cycle paths included in this section of the project should be at least 2m wide and should comprise of at least two 125mm layers of imported gravel that conforms to a Selected Sub Grade. Ideally the surfacing should be premix asphalt of 25mm thickness.

n) The cycle tracks should have a minimum separation of at least 1.5m from the edge of the road carriageway.

o) It is recommended that all block paved roadways and other paved areas are treated with weedicide prior to the laying of such.

p) All road signs and road markings should be in accordance with the latest SADCC Road Signs Manual.

D) Storm Water Drainage Network

In developing design guidelines and principles for the storm water drainage network for the site, the existing terrain and any proposed future developments of the site will have an impact on the storm water drainage network within the site.

As stated earlier the site falls from Presidents Drive to the Chobe River. The ground fall is in the range of 10 to 15m.

A preliminary flood study undertaken as part of this project indicates that, should a 1 in 100 year flood occur, it would submerge the project location under consideration. At the time of compiling this report, we are awaiting the flood study exercise which will indicate the level of submergence in case of a 1 in 50 and 1 in 20 year flood.

Taking cognisance of the above known factors the following design guidelines are proposed.

a) The drainage network should be designed utilizing the Standard Rational Drainage Design Method and be in accordance with the Botswana Road Design Manual requirements and parameters.

b) The design parameters that should be considered and taken cognisance of in designing the drain/channel sizes are the following.

Historical Rainfall Figures

Average Annual Rainfall for the area

Contributing Catchment Area

Rainfall Return Periods

Rainfall Intensity

Parameters that take in to account the gradient of the ground, the type of vegetation in the catchment area and the soil type in the catchment area.

KASANE RIVERFRONT CIVIL ENGINEERING GUIDELINES...continued

c) It is envisaged that the entire internal drainage network will ultimately drain in to the Chobe River following the general fall of the ground.

d) The internal drainage in this area should be covered rectangular drains with sufficient openings provided at regular intervals along the path of the drain to facilitate regular cleaning out of the drains which will reduce the flow of rubbish in to the Chobe River.

e) The openings provided could comprise of "mentis" grating.

f) It is also recommended that, debris traps be provided at suitable locations within the storm water drainage network. They should be positioned at locations which are easy to access for cleaning purposes. This will ultimately reduce the flow of rubbish in to the Chobe River.

g) It is also recommended that, the provision of oil/fuel interceptors within the drainage network prior to final discharge should be considered. This too will reduce the risk of polluting the Chobe River.

h) All culverts should be either circular/rectangular precast concrete which are readily available in the country.

i) All culverts should be provided with headwalls, wing walls and aprons on the inlet and outlet sides.

j) Stone pitching should be provided at culvert inlets and outlets to prevent eroding the earth embankments.

k) The provision of road side furniture to indicate the presence of underground culverts as per the Botswana Road Design Manual is recommended.

E) Water Supply

The statements contained in Section 2.5 of this report are applicable for this particular location and as such is not repeated herein.

F) Sewer Reticulation

The provision of a functional and cost effective sewer reticulation system is vital. The prevailing ground fall is from Presidents Avenue to the Chobe River.

Due to the terrain of the project site, it is envisaged that a common raw sewage pump station may be required at the lowest point on the site which should be able to serve the entire project area development. However should there be an existing council sewer in the vicinity, then all attempts should be made to connect any new sewer lines in to this after taking due cognisance of the carrying capacity of the council sewer. This then would eliminate the need for a pump station.

The sewer reticulation design and implementation should take cognisance of the following together with the standards stipulated in the Botswana National Wastewater and Sanitation Planning and Design Manual.

a) The waste water volumes that need to be catered for would be totally based on the initial water consumption figures for the various localities within the project site as prescribed by the WUC.

b) Daily volumes of waste water anticipated should be calculated using the prescribed peak flow factors.

c) Careful assumptions will have to be made on the percentage of water used which will be returned to the proposed sewer system, which in turn will dictate to the quantity of sewage that needs to be reticulated.

d) All sewers should be designed in such a manner that a minimum self cleansing velocity of 1.0m/sec is maintained throughout the system to prevent blockages.

e) The spacing of manholes should be such that they do not exceed the local council's rodding capability. This is normally restricted to about 50m. Manholes should be provided at all changes in direction and at all connection points. Direct plot connections to the sewer pipes should be avoided as much as possible.

f) All sewer pipes (gravity and pressure) should be upvc.

g) The depths of sewers should be at least 600mm below ground level.

h) Since this area is in a pedestrian precinct, the top of the manholes should be flush with the pedestrian walkways.

i) The minimum diameter for a gravity sewer should be 150mm.

j) The minimum diameter for individual plot connections should be 100mm.

k) Inspection chambers and rodding eyes should be provided at all sewer junctions within plots.

l) The sewers should be positioned in such a manner that the lengths of sewers and manholes required are minimised as best as possible.

m) Any proposed raw sewage pump station should have the following aspects incorporated in to the design.

The location of the pump station should be chosen very carefully such that it does not impinge on the aesthetics of the project area.

The pump station should be designed in such a manner that it has a wet well and a dry well.

All pumps should be located in the dry well and be below surrounding ground level.

• An on-line muncher should be provided on the inlet side of the wet well. This will eliminate the need for a screen collection mechanism for the screenings. This again is in view of the particular location and its intended use.

•The pump station size will be dependent upon the flow volumes, the number of stop/starts per day for the pumps and the invert levels of the sewers coming into the pump station.

•The wet well of the pump station should be provided with float switches to control the stop/starts of the pumps.

•The pumps provided should be of a similar type that the local council is experienced to ensure regular maintenance and the availability of spares.

•A water supply should be provided to the pump station site.

•A mains power supply together with a backup power supply should be provided.

•The pump station site should be fenced and gated.

•Adequate lighting should be provided with an emergency alarm system.

•Adequate paved parking area.

•The provision of a simple to use maintenance manual which should have daily, weekly, monthly and quarterly maintenance check lists. The manual should also have information pertaining to the various contractors, and suppliers of the various mechanical and electrical components of the system. Ideally the manual should be in Setswana and English.

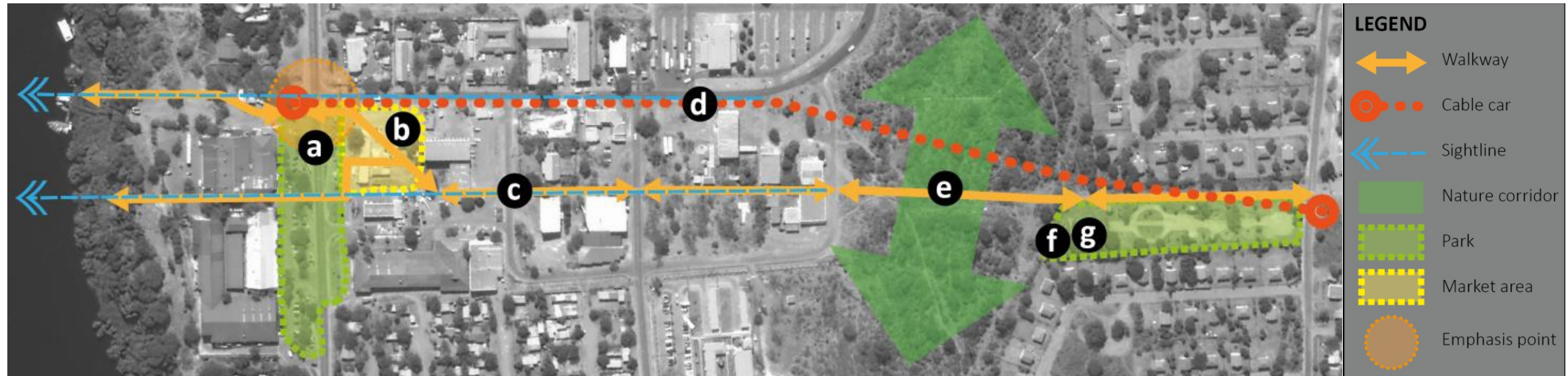
PRECINCT 'B' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES				ILLUSTRATION
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) GUIDELINES NOTES	
<p><u>Lodge Accommodation Along the river across Kgaphamadi area</u></p>	<p><u>Max 2 storey (7m floor to top ceiling)</u> <u>Obstruction will be a consideration.</u></p>	<p>FRONT - 5metres SIDE and REAR - 1.5metres</p>	<p>1 bay per 40m²</p>	<ol style="list-style-type: none"> Buildings along the river are to relate to the ground in such way that they minimise the physical impact on the ecosystem and the river tributaries. It is recommended that the use of Pilotis or Pile foundation should be used to suspend the building floors off the ground. (See <i>illustrative sketch on the right column</i>) Building orientation- A building along the river should not obstruct visual and physical access to the river of the immediate neighbour in terms of height and excessive continuous length along the river. Colour – Unless otherwise stated by the Design Review Panel , only Earthy colours of materials and paint shall be used on buildings along the river edge. The purpose is to eliminate possibility of visually offensive colours along the riverfront. Refer to chapter 8, Design Palette. Façade treatment and Materials. - Building façades on the riverfront should have balconies and wall openings (windows). No river facing complete solid building wall will be allowed unless textured with appropriate indigenous material to the approval of Design Review Panel. Refer to chapter 8, Design Palette. Roof – The use of exposed Galvanised Roof Sheets is prohibited on buildings along the river. Other roofing materials and styles are subject to approval of the Design Review Panel. Boundary wall- Solid boundary walls are prohibited in this area. Only full height perforated fence is allowed. Use of indigenous Construction material is encouraged. Maximum height shall be (1.5metres) Maximum 	<p>Note. Refer to chapter 5.1.2 (5) 'Development on slope towards the river' for guideline illustrations on scenarios to develop this row of plots.</p>

Applicable Environmental Design Standards

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
<p>GS1: All General Standards under GS1 shall be applicable to this development</p>	<p>GS2: All General Standards under GS2 shall be applicable to this development</p>	<p>GS3: All General Standards under GS3 shall be applicable to this development</p>	<p>GS4: All General Standards under GS4 shall be applicable to this development</p>	<p>GS5: All General Standards under GS4 shall be applicable to this development</p>	<p>GS6: All General Standards under GS4 shall be applicable to this development</p>	<p>GS7: All General Standards under GS4 shall be applicable to this development</p>

PLATEAU STAIRS STRIP



a) Improve the walkway between Town Centre and Plateau

A proposal is made to widen the walkway from the bottom of the Plateau stairs, re-route the same to pass through the Kasane Central Market, allowing for more walking space which is rather absent at the moment.

b) Landscaping in the Town Centre

A proposal is made to upgrade the central part of the Township by introducing some landscaping along the road passing between shopping centres.

c) Market Area

Improvements of the market area surrounding by way of incorporating sitting arrangements within the market area.

d) Cable car

A cable car was proposed to run from Plateau park to the river shore to give residents an aerial view of the Township as well as the Sedudu Island.

e) Improvement of the stairway from Plateau

Due to the constant encounters of people and animals along the stairway, a proposal was made to elevate the walkway to facilitate free passage of animals underneath the stairs without conflict

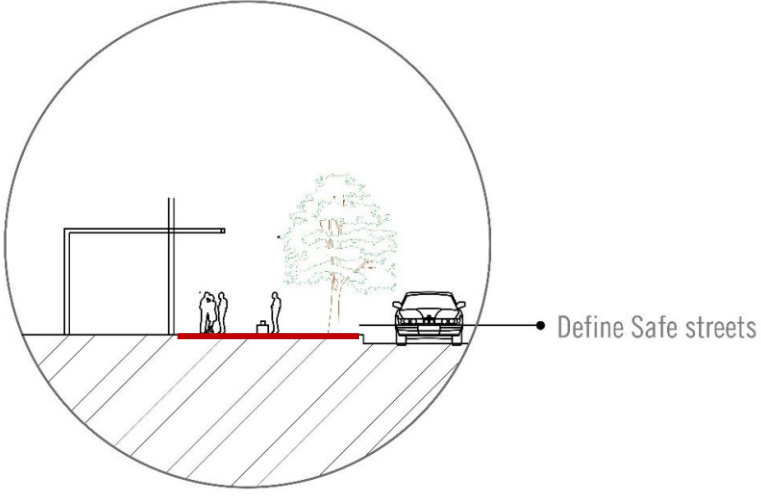
f) Swimming pool

A public splashing pool or swimming pool could be introduced at the extreme end of the park to augment the available amenities and remove children from the temptation to swim in the river. Visitors could enjoy the view of the river and scenery from across the boarder.

g) Coffeshop & viewing deck

Plateau Park is centrally located and is easily accessible to the general public from Kasane and Plateau. Currently the park serves only as a play area for children with very minimal facilities. Now the proposal is to have a coffee shop and a viewing deck in the park, towards the steps which could be a new meeting point with refreshments, an opportunity for sunset views and views of the river system from the plateau. It could be built from temporary material that would blend with the surroundings.

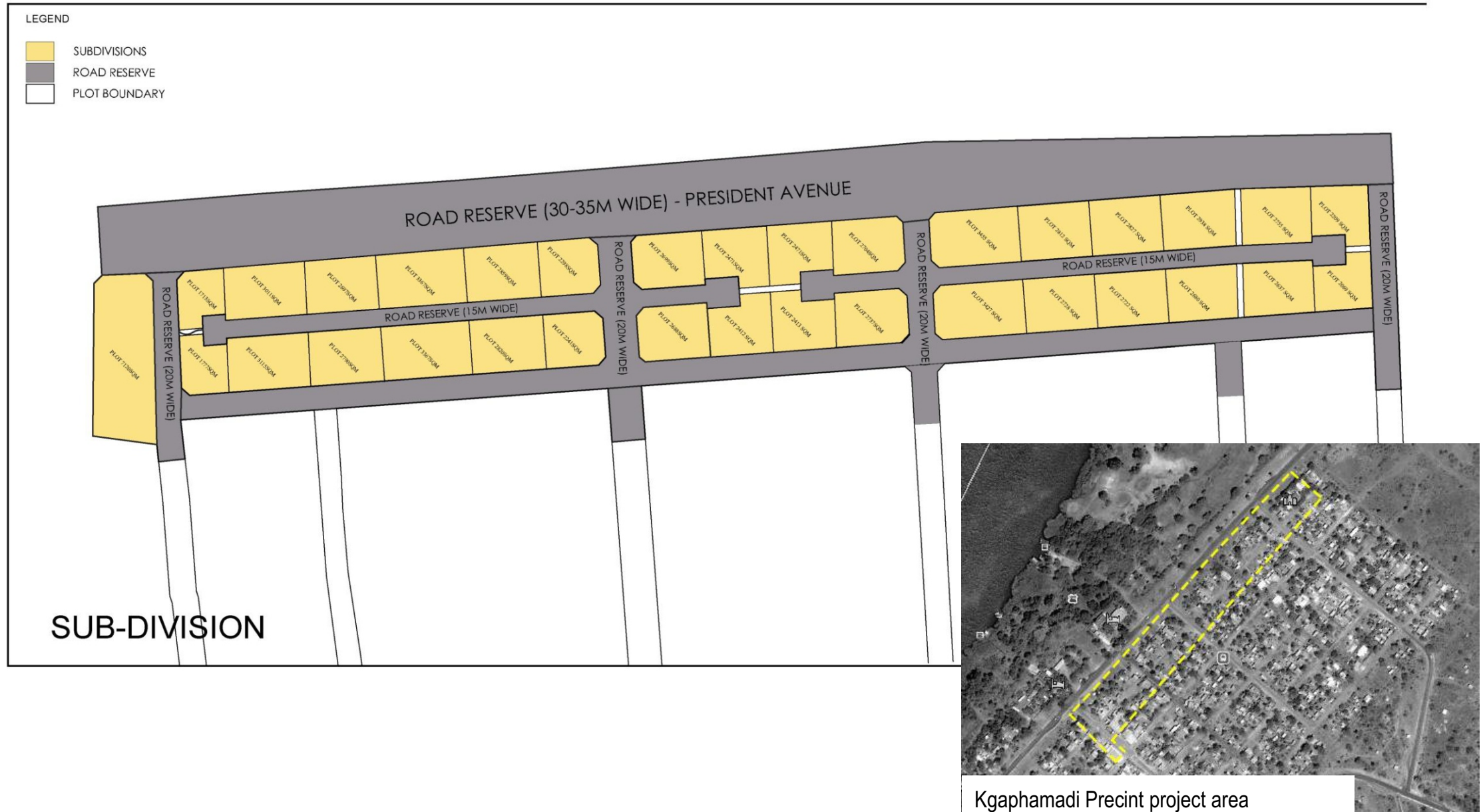
PRECINCT 'B' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES				ILLUSTRATION
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) GUIDELINES NOTES	
<p>KGAPHAMADI PRECINCT</p>	<p>MIXED USE Max 2 storey (7m floor to top ceiling) Obstruction will be a consideration.</p> <p>RESIDENTIAL Max 4 storey (14m floor to top ceiling) Obstruction will be a consideration.</p>	<p>MIXED USE Build to Plot Line.</p> <p>RESIDENTIAL FRONT - 5metres</p> <p>SIDE and REAR - 1.5metres</p>	<p>MIXED USE 1 bay per 40m²</p> <p>RESIDENTIAL 1 bay per Unit</p>	<p>i) Refer to Design palette at section 8 for indication of preferred design texture, material and colour.</p> <p>ii) Areas marked for Architectural accentuation shall have minimum height of 4 storeys and maximum 5 storeys.</p> <p>iii) Kgaphamadi street shall be designed to prioritise pedestrian scale and use over vehicles.</p>	 <p>Note. Refer to more illustrations in the following pages.</p>

Applicable Environmental Design Standards

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
<p>GS1: All General Standards under GS1 shall be applicable to this development</p>	<p>GS2: All General Standards under GS2 shall be applicable to this development</p>	<p>GS3: All General Standards under GS3 shall be applicable to this development</p>	<p>GS4: All General Standards under GS4 shall be applicable to this development</p>	<p>GS5: All General Standards under GS4 shall be applicable to this development</p>	<p>GS6: All General Standards under GS4 shall be applicable to this development</p>	<p>GS7: All General Standards under GS4 shall be applicable to this development</p>

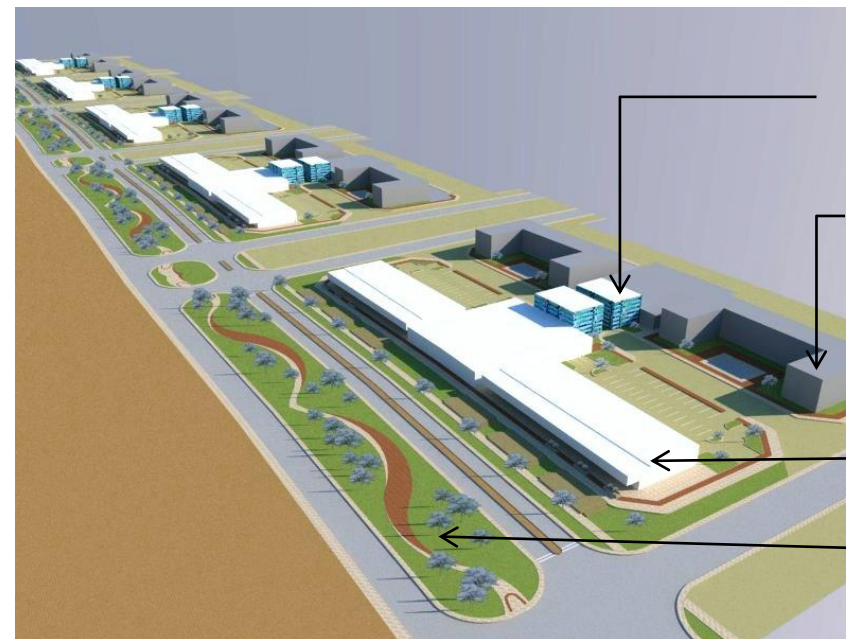
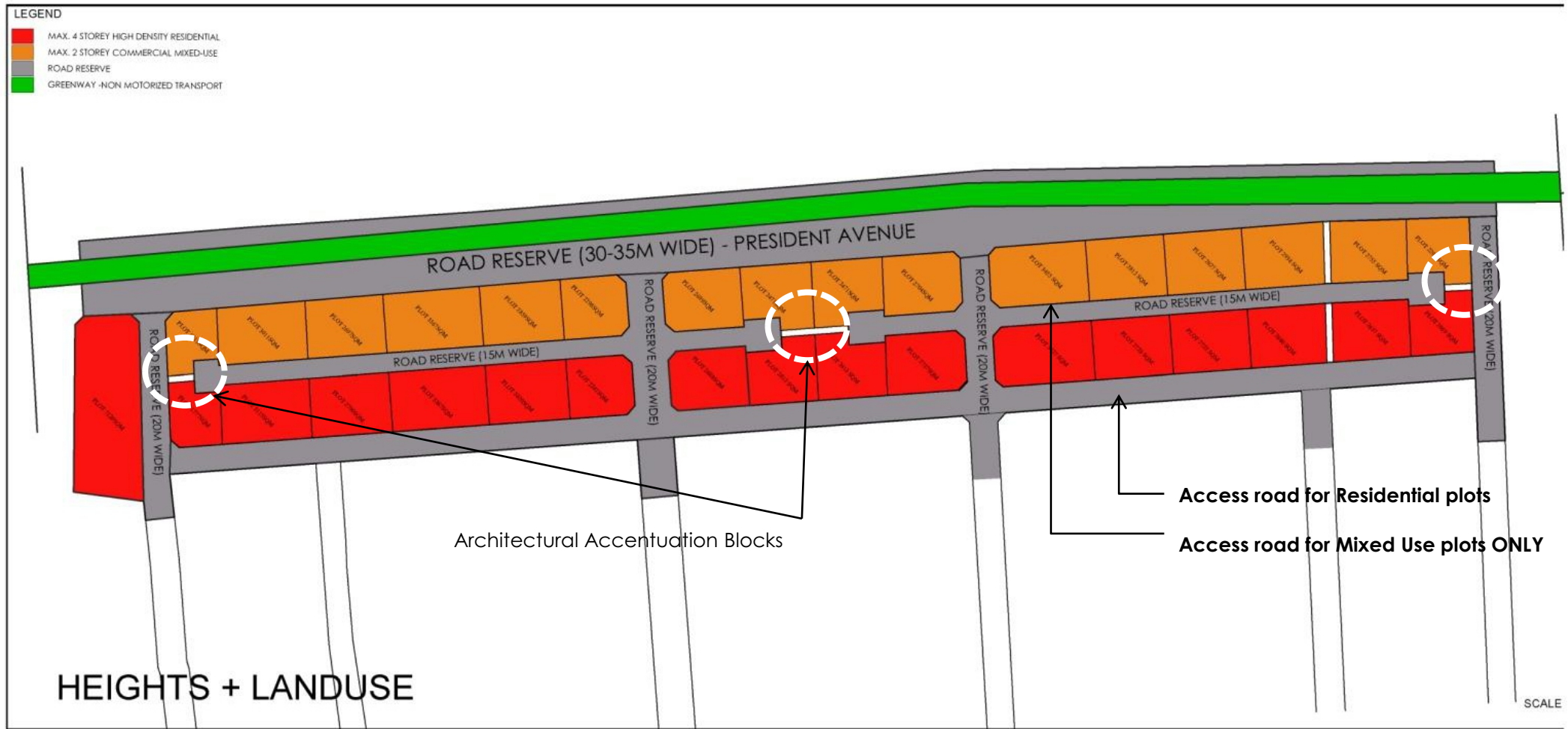
KGAPHAMADI PRECINCT - DEVELOPMENT GUIDELINES



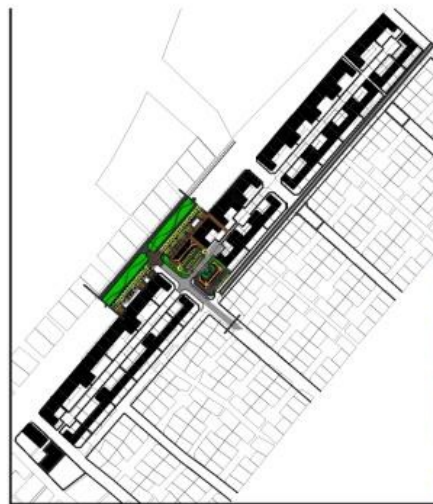
Kgaphamadi Precinct project area

Applicable Environmental Design Standards

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
GS1: All General Standards under GS1 shall be applicable to this development	GS2: All General Standards under GS2 shall be applicable to this development	GS3: All General Standards under GS3 shall be applicable to this development	GS4: All General Standards under GS4 shall be applicable to this development	GS5: All General Standards under GS4 shall be applicable to this development	GS6: All General Standards under GS4 shall be applicable to this development	GS7: All General Standards under GS4 shall be applicable to this development



- Architectural Accentuation Blocks
- Residential
- Mixed Use Retail/Office
- NMT Zone and Landscaping



KEY PLAN



← Mixed Use Retail/Office

← Mixed Use Parking behind

← Residential

← Residential Parking and Access

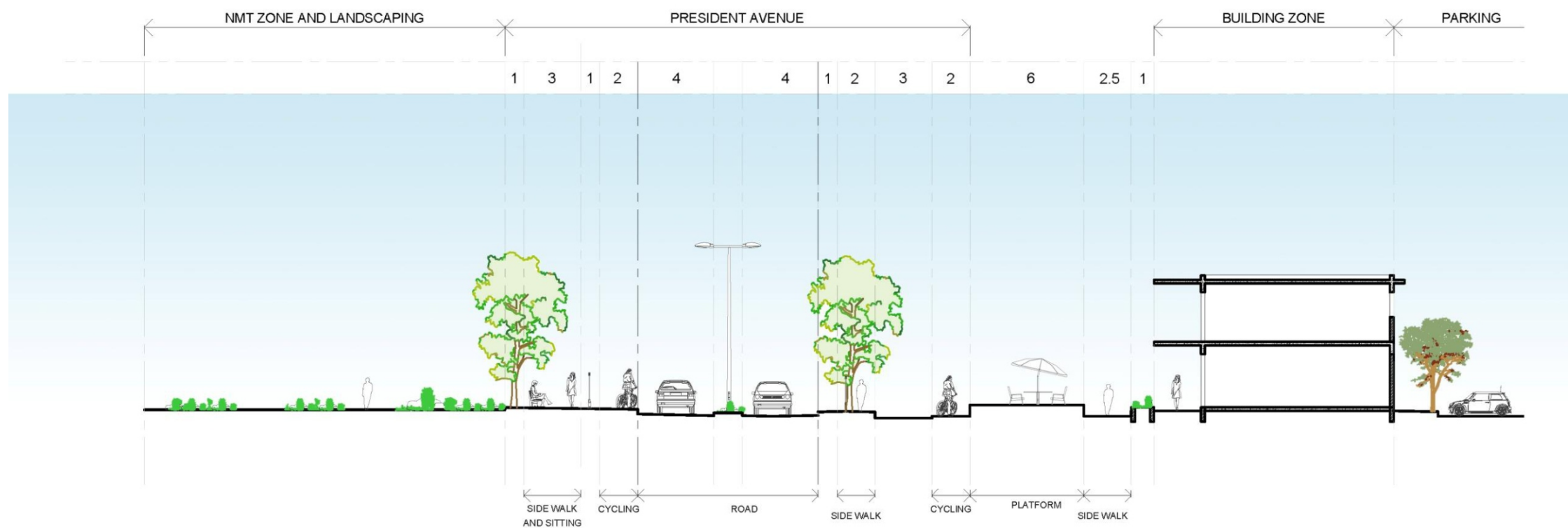
SCALE

DETAILED PORTION OF KGAPHAMADI VISION PLAN



Transforming a road into a shared street





SPORTS PRECINCT - DEVELOPMENT ILLUSTRATIONS



Applicable Environmental Design Standards – Sports Precinct

This development is recommended for Voluntary Environmental Design Standard **equivalent to a minimum of Four (4) Star (Best Practice) in accordance with the Green Building Council of South Africa**. The following Voluntary standards or better shall be applicable to this development (refer voluntary standards section for details):

VS2: Natural Ventilation; VS3: Thermal Gradient and Condensation ;VS4: Water Recycling and Rainwater Harvesting; VS5: Net-Zero Power and Net-Zero Water Technologies

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
GS1: All General Standards under GS1 shall be applicable to this development	GS2: All General Standards under GS2 shall be applicable to this development	GS3: All General Standards under GS3 shall be applicable to this development	GS4: All General Standards under GS4 shall be applicable to this development	GS5: All General Standards under GS4 shall be applicable to this development	GS6: All General Standards under GS4 shall be applicable to this development	GS7: All General Standards under GS4 shall be applicable to this development

KGAPHAMADI PRECINCT CIVIL ENGINEERING GUIDELINES

A) General

This area is demarcated by the proposed junction at the Spar Complex in the northwest, running along Presidents Avenue towards the existing Community Junior Secondary School Sports Grounds; a distance of approximately 1km. The new developments proposed lie to the east and west of Presidents Avenue. A slip road is proposed that will run parallel with Presidents Avenue to serve the existing lodges along this section. This is to reduce the number of individual accesses on to Presidents Avenue. The mixed use development that is proposed to the east of Presidents Avenue will be provided access from within the Kgaphamadi Suburb; there will be no direct access to this new mixed use development off Presidents Avenue. The ground fall is from the extreme east of the proposed development towards Presidents Avenue and a further fall towards the proposed slip road. The fall is approximately 5m from across the project area under consideration.

B) Bush Clearing and Topsoil Retention

Since the area under consideration is already built up except for those areas that lie between Presidents Avenue and the proposed slip road, very little bush clearing is envisaged. However all large trees (say a girth of more than 1m) should be retained. The following aspects have to be put in place to safe guard the site.

Whilst the initial topographical survey of the site is being carried out, all large trees (say a girth of more than 1m) will have to be identified and surveyed.

a) These identified large trees will need to be physically marked on site and the contract documents prepared should clearly state the penalty for the destruction of such marked trees.

b) Should there be the need to modify slightly any road alignments or service alignments due to the presence of these large trees, then the designs should be flexible to accommodate these minor changes.

c) All trees that are eventually cleared for the development areas should be cut and stacked in to suitable lengths (say 400mm) for the use by the local residents.

d) The removal of topsoil should be kept to a bare minimum, say 150mm in depth. It should be stockpiled in a neat manner for later re-use for landscaping.

C) Road Network and Vehicular/Pedestrian/Cyclist Interactions

The road network within the project area needs to take into account the facilities for pedestrians and cyclists that are envisaged.

The following aspects need to be taken cognisance of during the design and implementation stages.

a) The road reserve width along this section of Presidents Avenue should be clearly set out. This will enable the council to remove any unauthorised signage from within the road reserve.

b) The horizontal alignment of President Avenue along this section may require slight modification to suit any proposed cross section which allows for the provision of a slip road and for cycle paths in the future.

c) It is recommended that the existing vertical alignment be modified slightly to be able to accommodate the proposed slip road and cycle paths. In addition the existing surfacing of the road be re-cycled with the existing base layer and re-laid since this portion of the road is badly deformed with quite extensive edge damage and carriageway damage. This should be done after treating the underlying sub base material to conform to normal specifications.

d) The recommended treatment of the road should comply with the Botswana Road Design Manual and relevant specifications for bulk earthworks, selected sub grade, sub base, base and surfacing. In general they are as listed below.

Bulk Earthworks; compacted to 90% MOD AASHTO density; CBR = 3%

Selected Sub Grade; compacted to 93% MOD AASHTO density; CBR = 15%

Sub Base; compacted to 95% MOD AASHTO density; CBR = 45%

Base; compacted to 98% MOD AASHTO density; CBR = 80%

e) The proposed slip road should have a carriageway width of 6m and two surfaced shoulders of 1m each; giving a total surfaced width of 8m. The layer works for the slip road should comply with Item (d) above. The surfacing to be a bituminous double seal across the whole 8m width.

f) Any paving required should comprise of 80 mm thick, 30 Mpa Interlocking Pavers laid on a 30mm bed of river sand after the preparation of the Bulk Earthworks, Selected Sub Grade, Sub Base and the Base to the prescribed standards as recommended by the latest Botswana Roads Department Design Manual. The colour of the pavers should be chosen in accordance with the location under consideration. Red colour pavers are recommended at junctions and pedestrian crossings.

g) All junctions within the project area should be controlled by either "4 way" or "3 way" STOP Signs. This is by far the safest mode of traffic control for the project area. Traffic lights are not warranted given the traffic volumes.

h) All pedestrian crossings should be raised at least 100mm above the finished road level and be at least 2m wide and be constructed of Interlocking Block Paving, red in colour. This will then act as a traffic calming measure and will also alert the driver to the need to reduce speed when approaching the pedestrian crossing point.

i) The internal paved areas in the project area should ideally comprise of the following :

Bulk Earthworks

Selected Sub Grade

Sub Base

Interlocking Paving/Paving Slabs/Paving Bricks

j) It is preferable that, naturally occurring gravels that comply with the Roads Department Specifications are used for the bulk earthworks, selected sub grade, sub base and the base.

k) There are options available for the surfacing of the roads. These are a double seal surfacing, a cape seal, pre mix asphalt or interlocking block paving. The choice will be dependent upon the capital cost, maintenance cost and the location of its use. It is recommended that Presidents Avenue be treated with pre mix asphalt surface.

l) Any cycle paths included in this section of the project should be at least 2m wide and should comprise of at least two 125mm layers of imported gravel that conforms to a Selected Sub Grade. Ideally the surfacing should be pre-mix asphalt of 25mm thickness.

m) The cycle tracks should have a minimum separation of at least 1.5m from the edge of the road carriageway.

n) It is recommended that all block paved roadways and other paved areas are treated with weedicide prior to the laying of such.

o) All road signs and road markings should be in accordance with the latest SADCC Road Signs Manual.

D) Storm Water Drainage Network

In developing design guidelines and principles for the storm water drainage network for the site, the existing terrain and any proposed future developments of the site will have an impact on the storm water drainage network within the site.

As stated earlier the average fall across the site from within the Kgaphamadi Suburb towards Presidents Avenue and to the west of Presidents Avenue is about 5m.

A preliminary flood study undertaken as part of this project indicates that, should a 1 in 100 year flood occur, it would submerge a portion of the project area under consideration. At the time of compiling this report, we are awaiting the flood study exercise which will indicate the level of submergence in case of a 1 in 50 and 1 in 20 year flood.

Taking cognisance of the above known factors the following design guidelines are proposed.

a) The drainage network should be designed utilizing the Standard Rational Drainage Design Method and be in accordance with the Botswana Road Design Manual requirements and parameters.

b) The design parameters that should be considered and taken cognisance of in designing the drain/channel sizes are the following.

- Historical Rainfall Figures

- Average Annual Rainfall for the area

- Contributing Catchment Area

- Rainfall Return Periods

- Rainfall Intensity

- Parameters that take in to account the gradient of the ground, the type of vegetation in the catchment area and the soil type in the catchment area.

c) It is envisaged that the entire internal drainage network will ultimately drain in to the Chobe River following the general fall of the ground.

d) The internal drainage in this area could be a mix of open and covered drains with sufficient openings provided at regular intervals along the path of the drain to facilitate regular cleaning out of the covered drains which will reduce the flow of rubbish in to the Chobe River.

e) The openings provided could comprise of "mentis" grating.

f) It is also recommended that, debris traps be provided at suitable locations within the storm water drainage network. They should be positioned at

KGAPHAMADI PRECINCT CIVIL ENGINEERING GUIDELINES

locations which are easy to access for cleaning purposes. This will ultimately reduce the flow of rubbish in to the Chobe River.

g) It is also recommended that, the provision of oil/fuel interceptors within the drainage network prior to final discharge should be considered. This too will reduce the risk of polluting the Chobe River.

h) All culverts should be either circular/rectangular precast concrete which are readily available in the country.

i) All culverts should be provided with headwalls, wing walls and aprons on the inlet and outlet sides.

j) Stone pitching should be provided at culvert inlets and outlets to prevent eroding the earth embankments.

k) The provision of road side furniture to indicate the presence of underground culverts as per the Botswana Road Design Manual is recommended.

E) Water Supply

The statements contained in Section 2.5 of this report are applicable for this particular location and as such is not repeated herein.

F) Sewer Reticulation

The provision of a functional and cost effective sewer reticulation system is vital.

Should there be an existing council sewer in the vicinity, then all attempts should be made to connect any new sewer lines in to this after taking due cognisance of the carrying capacity of the council sewer.

The sewer reticulation design and implementation should take cognisance of the following together with the standards stipulated in the Botswana National Wastewater and Sanitation Planning and Design Manual.

a) The waste water volumes that need to be catered for would be totally based on the initial water consumption figures for the various localities within the project site as prescribed by the WUC.

b) Daily volumes of waste water anticipated should be calculated using the prescribed peak flow factors.

c) Careful assumptions will have to be made on the percentage of water used which will be returned to the proposed sewer system, which in turn will dictate to the quantity of sewage that needs to be reticulated.

d) All sewers should be designed in such a manner that a minimum self cleansing velocity of 1.0m/sec is maintained throughout the system to prevent blockages.

e) The spacing of manholes should be such that they do not exceed the local council's rodding capability.

This is normally restricted to about 50m.

Manholes should be provided at all changes in direction and at all connection points. Direct plot connections to the sewer pipes should be avoided as much as possible.

f) All sewer pipes (gravity and pressure) should be upvc.

g) The depths of sewers should be at least 600mm below ground level.

h) Since this area is in a pedestrian precinct, the top of the manholes should be flush with the pedestrian walkways.

i) The minimum diameter for a gravity sewer should be 150mm.

j) The minimum diameter for individual plot connections should be 100mm.

K) Inspection chambers and rodding eyes should be provided at all sewer junctions within plots.

l) The sewers should be positioned in such a manner that the lengths of sewers and manholes required are minimised as best as possible.

m) Should there be a need to provide a raw sewage pump station then the following aspects should be incorporated in to the design.

- The location of the pump station should be chosen very carefully such that it does not impinge on the aesthetics of the project area.

- The pump station should be designed in such a manner that it has a wet well and a dry well.

- All pumps should be located in the dry well and be below surrounding ground level.

- An on-line muncher should be provided on the inlet side of the wet well. This will eliminate the need for a screen collection mechanism for the screenings. This again is in view of the particular location and its intended use.

- The pump station size will be dependent upon the flow volumes, the number of stop/starts per day for the pumps and the invert levels of the sewers coming into the pump station.

- The wet well of the pump station should be provided with float switches to control the stop/starts of the pumps.

- The pumps provided should be of a similar type that the local council is experienced to ensure regular maintenance and the availability of spares.

- A water supply should be provided to the pump station site.

- A mains power supply together with a backup power supply should be provided.

- The pump station site should be fenced and gated.

- Adequate lighting should be provided with an emergency alarm system.

Adequate paved parking area.

- The provision of a simple to use maintenance manual which should have daily, weekly, monthly and quarterly maintenance check lists. The manual should also have information pertaining to the various contractors, and suppliers of the various mechanical and electrical components of the system. Ideally the manual should be in Setswana and English.

PRECINCT C

PRECINCT 'C' GENERAL ETHOS

The key developments in Precinct C are the proposed Conference facility and a Cottage type resort development on the ecological zone. The Conference facility is recommended for high level green design iconic architectural feature that responds to the river proximity in a sustainable and innovative manner.

The Chalet type resort development will also be of high green design standard. The preservation of ecological habitat will be a priority but most importantly an aggressive tree planting campaign will be mandatory to promote a dense indigenous tree cover.

PRECINCT 'C' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES				ILLUSTRATION
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) GUIDELINES NOTES	
<p>Hotel and Conference Facility</p>	<p>Maximum 2 storey (7metres ground floor to top ceiling. Obstruction will be a consideration.</p>	<p>N/A</p>	<p>1 bay per 40m²</p>	<ol style="list-style-type: none"> i. It is recommended that the building should target 'Voluntary Standard' as articulated in chapter 5.2 Environmental Design Guidelines in an effort to promote the Green and Clean agenda of Kasane Kazungula Redevelopment Plan. ii. Refer to Design palette at section 8 for indication of preferred design texture, material and colour. iii. Provide roof garden with unobstructed views to the Chobe river. iv. An attractive facility with innovative architectural design of the Conference building that slightly encroaches into the river in an ecologically sensitive manner.. 	<p>Note. Refer to chapter 5.1.2 (5) 'Development on slope towards the river' for guideline illustrations on scenarios to develop this type of plot.</p>


Applicable Environmental Design Standards

This development is recommended for Voluntary Environmental Design Standard equivalent to a minimum of Four (4) Star (Best Practice) in accordance with the Green Building Council of South Africa. The following Voluntary standards or better shall be applicable to this development (refer voluntary standards section for details):

VS2: Natural Ventilation; **VS3:** Thermal Gradient and Condensation ;**VS4:** Water Recycling and Rainwater Harvesting; **VS5:** Net-Zero Power and Net-Zero Water Technologies

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
<p>GS1: All General Standards under GS1 shall be applicable to this development</p>	<p>GS2: All General Standards under GS2 shall be applicable to this development</p> <p>CS2-1: Design for energy efficiency for buildings within the Ecological Zone shall be based on ASHRAE 90.1 (2013)- Energy Standard for.</p>	<p>GS3: All General Standards under GS3 shall be applicable to this development</p>	<p>GS4: All General Standards under GS4 shall be applicable to this development</p>	<p>GS5: All General Standards under GS4 shall be applicable to this development</p>	<p>GS6: All General Standards under GS4 shall be applicable to this development</p>	<p>GS7: All General Standards under GS4 shall be applicable to this development</p>

PRECINCT 'C' DEVELOPMENT GUIDELINES

SITE	RECOMMENDED GUIDELINES				ILLUSTRATION
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) GUIDELINES NOTES	
Resort Residential Hospitality Cottage Resort Development	Maximum 1 storey	N/A	1 bay per 40m ²	<ol style="list-style-type: none"> 1. Freestanding Cottage type development under common management 2. It is recommended that the use of Pilotis or Pile foundation should be used to suspend the building floors off the ground. 3. Colour – Unless otherwise stated by the Design Review Panel, only Earthy colours of materials and paint shall be used on buildings along the river edge. The purpose is to eliminate possibility of visually offensive colours along the riverfront. 4. Façade treatment and Materials. - Building façades on the riverfront should have balconies and wall openings (windows). No river facing complete solid building wall will be allowed unless textured with appropriate indigenous type material to the approval of Design Review Panel. 5. Roof – The use of exposed Galvanised Roof Sheets is prohibited on buildings along the river. Other roofing materials and styles are subject to approval of the Design Review Panel. 6. Boundary wall- Solid boundary walls are prohibited facing the river. Only full height perforated fence is allowed. Maximum height (1.8metres) 	<p>Note. Refer to chapter 5.1.2 (5) 'Development on slope towards the river' for guideline illustrations on scenarios to develop this type of plot.</p>  <p>Typical Cottage development on raised deck above flood level</p>

Applicable Environmental Design Standards

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
GS1: All General Standards under GS1 shall be applicable to this development	GS2: All General Standards under GS2 shall be applicable to this development .	GS3: All General Standards under GS3 shall be applicable to this development	GS4: All General Standards under GS4 shall be applicable to this development	GS5: All General Standards under GS4 shall be applicable to this development	GS6: All General Standards under GS4 shall be applicable to this development	GS7: All General Standards under GS4 shall be applicable to this development

4.2 KAZUNGULA GUIDELINES

INTRODUCTION

- LETSWAI/ HOT SPRINGS RECREATIONAL PRECINCT
- TRADE LOGISTICS PARK
- BUDGET HOTEL JUNCTION
- RETIREMENT AND HOLIDAY HOMES

4.2.1 INTRODUCTION

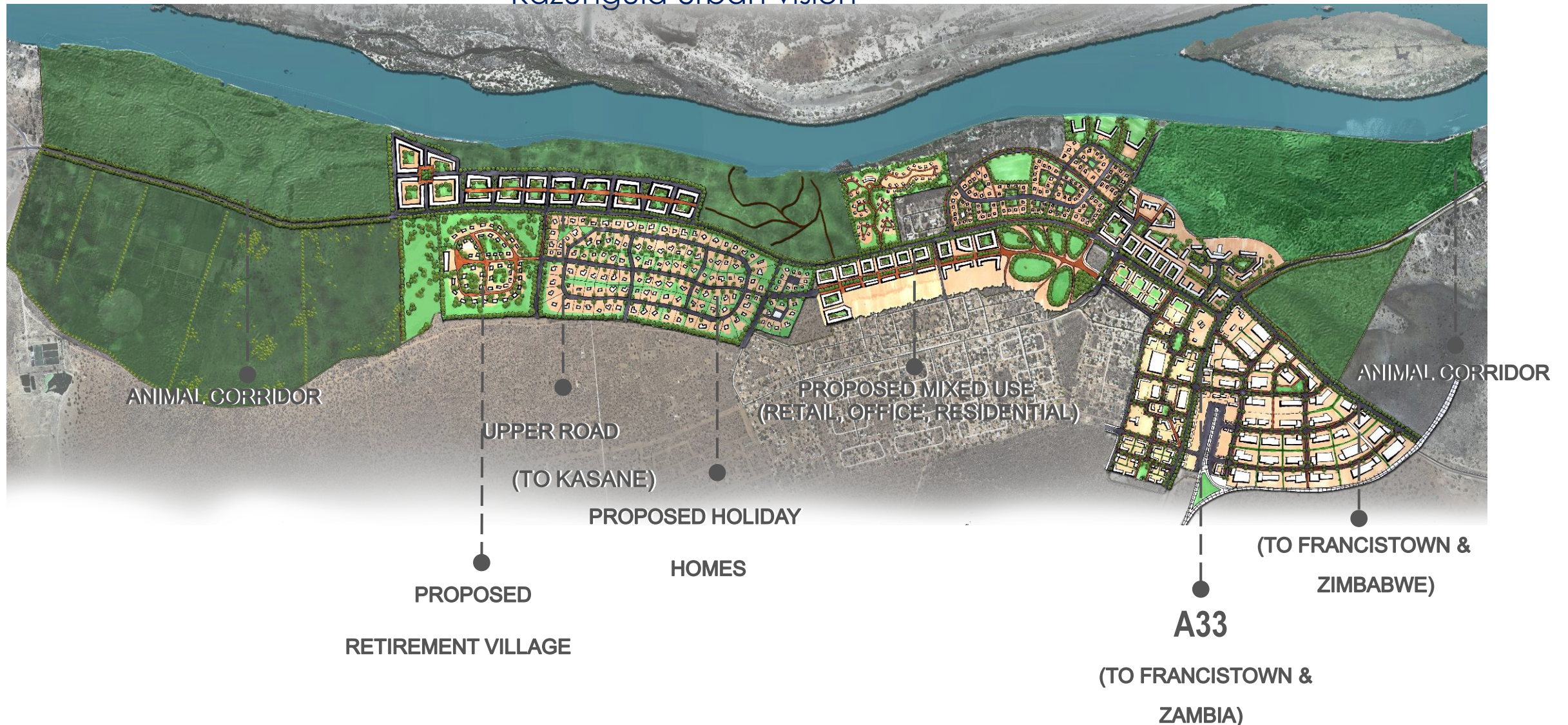
Kazungula is envisioned as playing a complementary role to Kasane. The trade and logistics hub, budget hotel and market precinct as well as holiday and retirement home precinct are the main developments being promoted by these guidelines.

In line with upholding the ecological objectives and themes proposed for the area, Kazungula has minimal urbanisation along its main road spine, the A33 road, but rather it will promote a natural and relaxed environment that give priority to wildlife and attract holiday and retirement homes in place of industrial and commercial uses. The Kazungula Framework plan below shows the proposed Urban Vision for the rest of Kazungula.

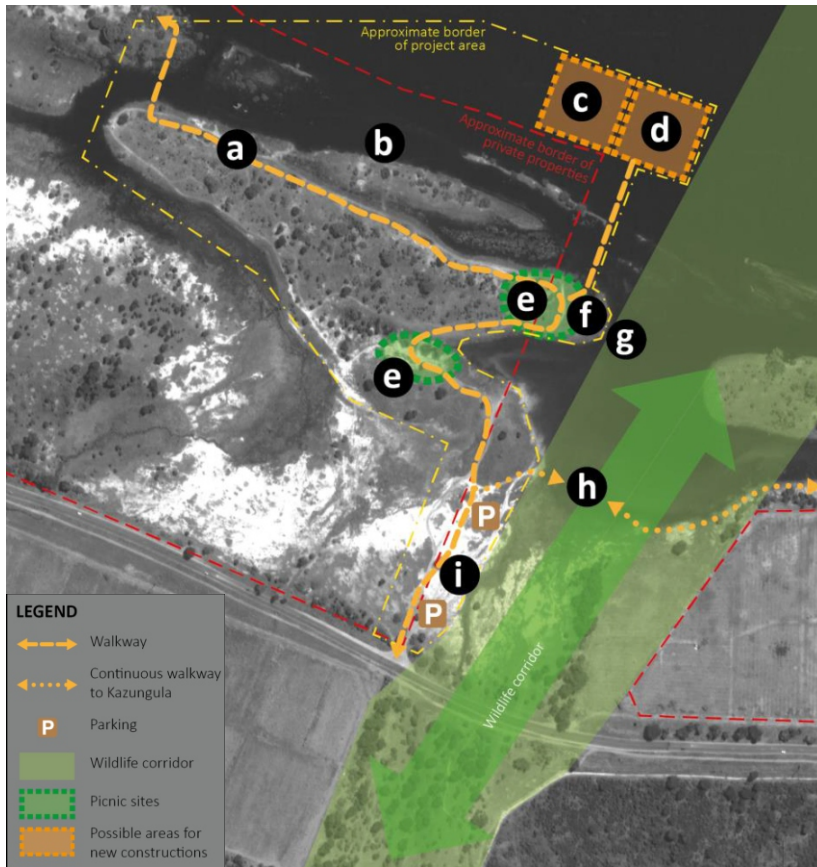
Note. Not all the land availed in Kazungula for guidelines development under this project has been fully planned for. Through the stakeholder workshops that were undertaken at preliminary design stage, there was no short to medium term demand for guidelines in some of the plots.

It is therefore recommended that those plots that were recommended by the Redevelopment plan but not detailed under this project should be reserved by Government under the land bank policy through Botswana Tourism Organisation for future detail and design as the dynamics of the future local economy shall determine.

Kazungula Urban vision



LETSWAI/ HOT SPRINGS RECREATIONAL PRECINCT



This proposal falls within a private property. Therefore its implementation is subject to agreement with the property owner. Proposed activities include the following;

a) A walkway is proposed around the proposed project area, as a part of the whole riverside walkway.

b) Fishing spot

Members of the public have for years caught fish for food on the Chobe River and they still do today. This idea therefore looks at developing a suitable secluded spot to cater for the daily needs of fishing families and individuals.

c) Secured swimming area

Swimming in the Chobe River is prohibited since the river is infested with crocodiles and hippos. The proposal made therefore is to have a swimming pool within the banks of the river, protected from the likely intrusion by the river animals. This pool would still give the public the natural feeling of swimming in the river. The pool will have linkage with the walkway. Other possible sites for such a pool could be along the riverside of Kasane town, at Seboba, or by the riverside of Kazungula.

d) Floating restaurant

A proposal is made to have a restaurant which is fully or partially suspended above the water giving customers a nice view. See Figure 10. If not at Letswai, the proposal could also be implemented elsewhere, such as along the riverside of Kazungula.

e) Picnic area with a grill

Residents already frequent this spot for picnicking and it is recommended that the area be improved. The necessary facilities like

a grill and waste bins will be incorporated in the proposed area.

f) Bird-watching tower

As many would be attracted to come o Letswai to enjoy natural views and wildlife, a bird-watching tower could be placed. It could cater for more than watching birds. See Figure 10. Bird-watching tower could also be raised at Seboba, as complement to existing facilities.

g) Animal corridor

This area is proposed to remain to remain an animal corridor because it is one of the few accesses to the river by wild animals. There should be a fence protecting visots from large animals.

h) The hot springs

The hot springs are national monument and must be protected. Local community members as well as tourists have interest in visiting the springs when the water level allows. There should be a secure access way, which can also be the continuation of the walkway towards Kazungula.

i) Parking and entrance

At the entrance to the fenced area there should also be secure parking places.

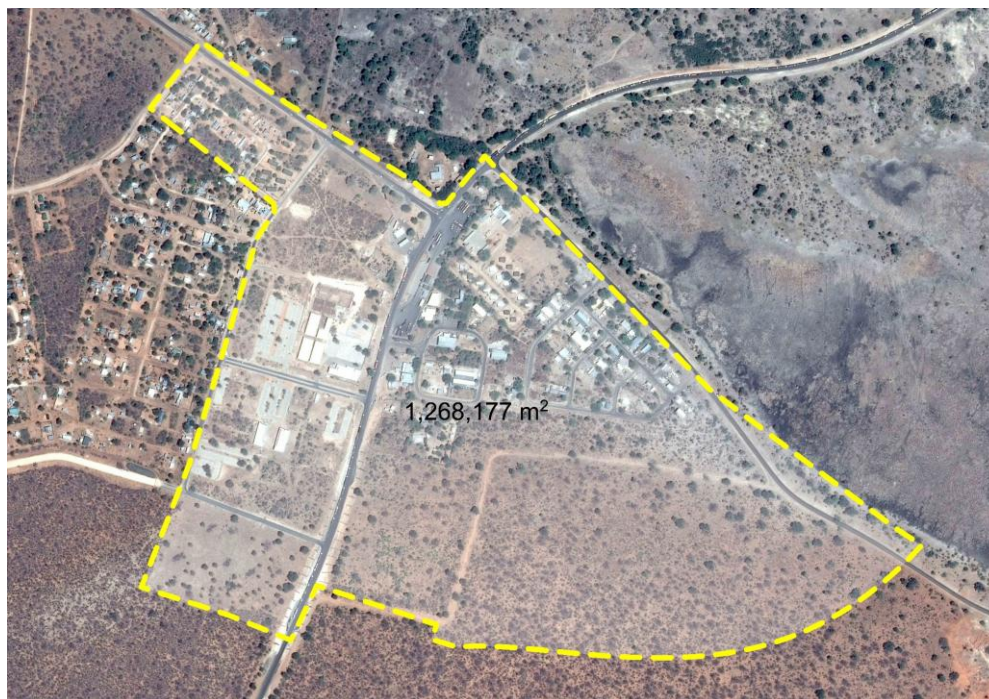
KAZUNGULA LOGISTICS PARK PRECINCT

LOGISTICS PARK PRECINCT GENERAL ETHOS

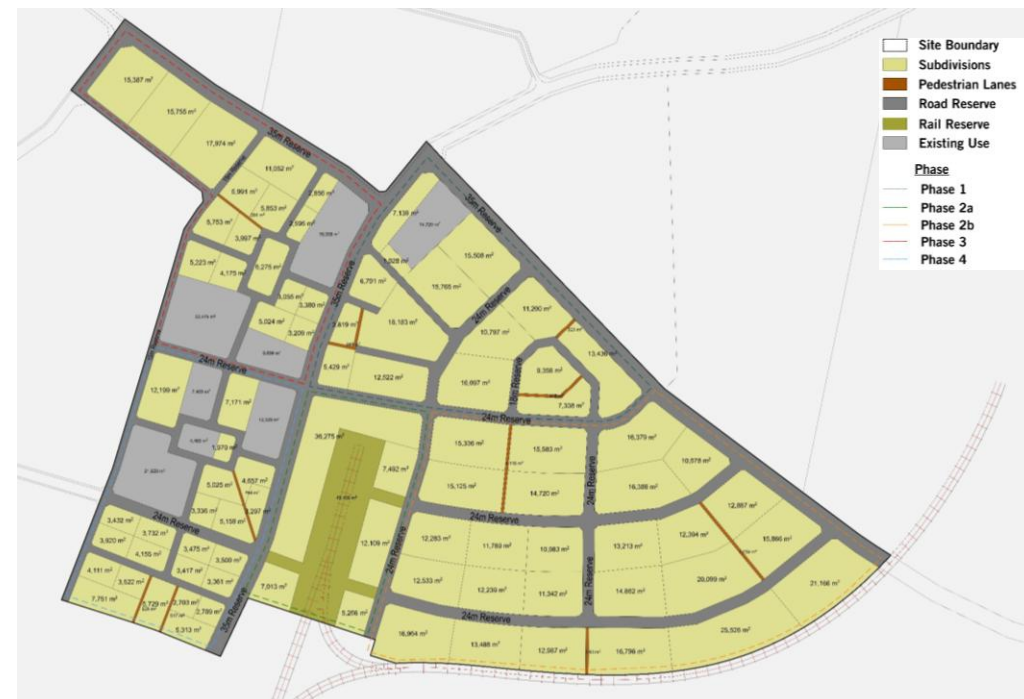
The Logistics park will be a goods trade centre complemented by a truck depot/distribution centre. It is envisioned that the upcoming Kazungula bridge and rail development will provide greater support and demand for these proposed activities as goods would be able to come in either via rail into the industrial/ logistics park for storage before transfer from the truck depot to Francistown or Zimbabwe via Freight trucks.

Note. The guidelines and precinct plan proposed for the Logistics park in this manual are only limited to being conceptual plans. It is therefore recommended that a detailed logistics feasibility study be undertaken to inform the detailed precinct plan. Other studies such as topographic surveys and geotechnical investigation will have to be done before a proper final precinct plan can be completed.

Based on this anticipated freight activity in the area, the framework goes on to propose commercial/ service industrial activity directly opposite the Logistics park. It is envisioned that this area will be populated by businesses aligned, or affiliated with the freight sector such as truck repair shops.



Location and Current Use

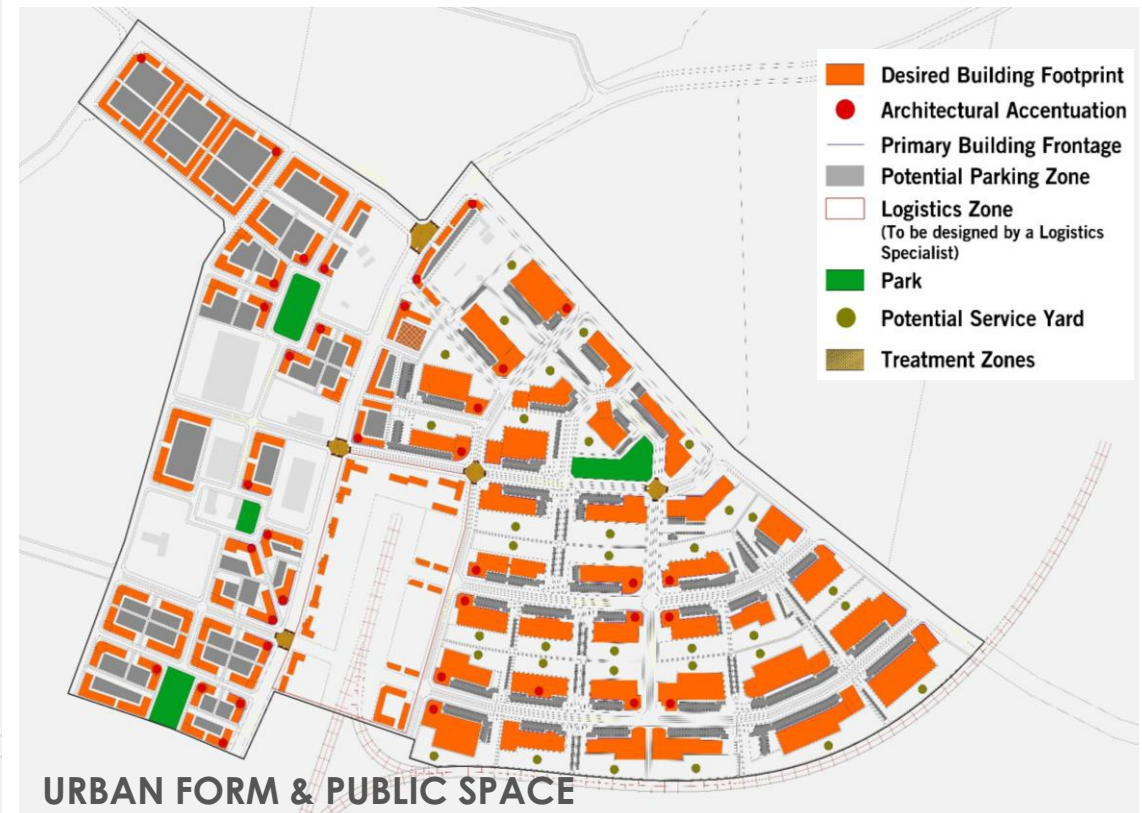
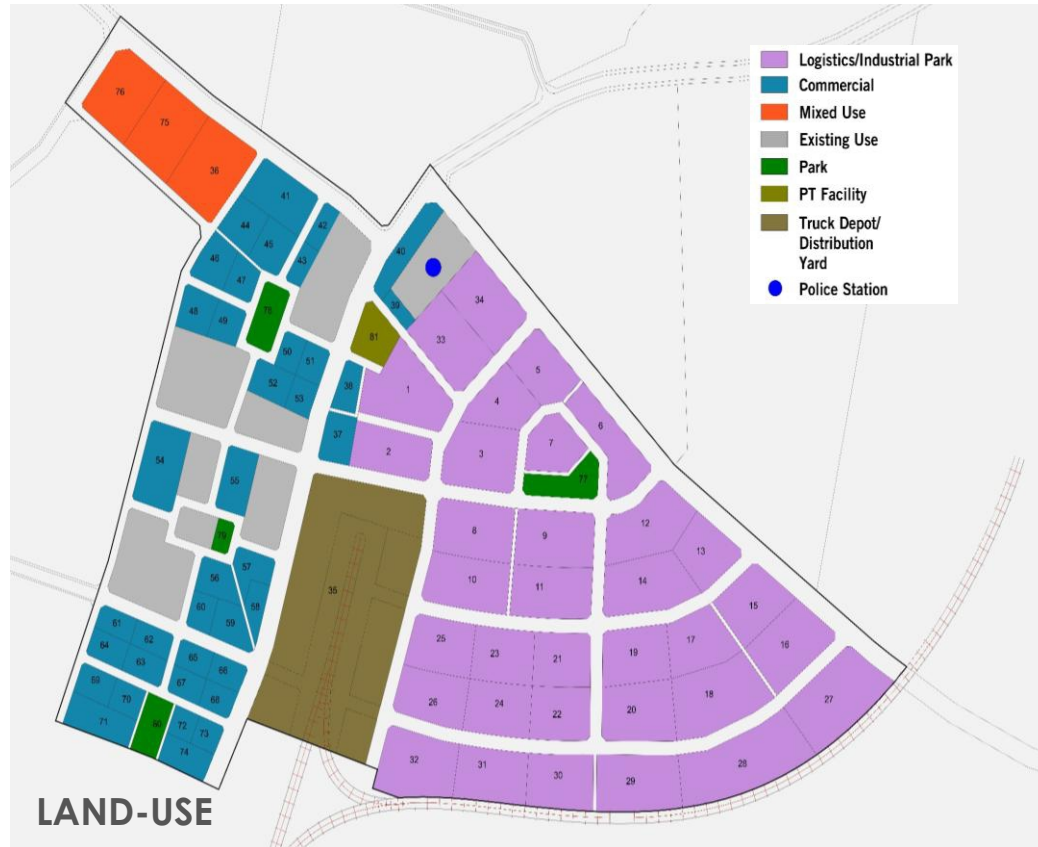


Subdivision Plan

Applicable Environmental Design Standards for Kazungula Logistics Park.

Indoor Env Quality GS1:	Energy Efficiency GS2:	Water Efficiency GS3:	Land Use and Ecology GS4:	Materials GS5:	Transport GS6:	Emissions GS7:
GS1: All General Standards under GS1 shall be applicable to this development	GS2: All General Standards under GS2 shall be applicable to this development .	GS3: All General Standards under GS3 shall be applicable to this development	GS4: All General Standards under GS4 shall be applicable to this development	GS5: All General Standards under GS4 shall be applicable to this development	GS6: All General Standards under GS4 shall be applicable to this development	GS7: All General Standards under GS4 shall be applicable to this development

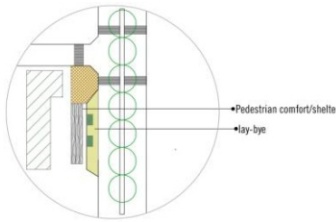
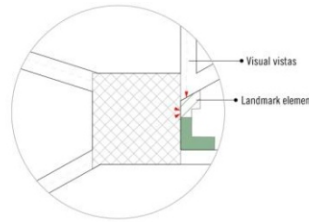
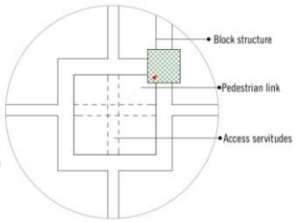
Kazungula Logistics Park Precinct Plan Guidelines



DESIGN PRINCIPLES- KAZUNGULA

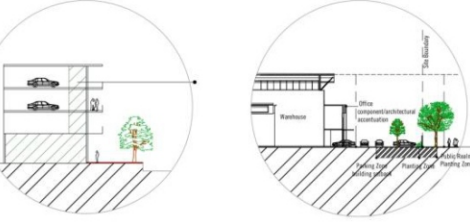
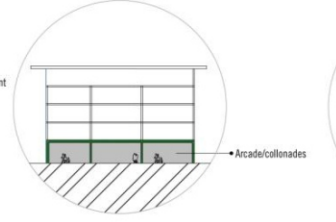
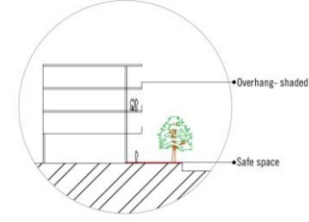
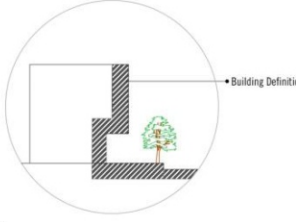
1. MAKING CONNECTIONS

- **Block Structure**
 - Finer Grain Blocks
 - Pedestrian Links
 - Access Servitudes
- **Visual Connections**
 - Ensure Vistas in orientating elements
 - Create Landmark elements
- **Public Transit**
 - Physical proximity(walking distance- 400m -5 minute walk)
 - Ensure Space around PT stops



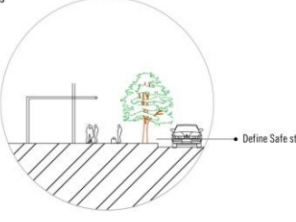
2. POSITIVE EDGE CONDITIONS

- **Street Related Design**
 - Promote definition of Street and Space
 - Building Definition
- **Building Position**
 - Build to line
 - Build within zones
- **Comfort**
 - Shade Edges through Setbacks
 - Colonnades, Arbors, Overhangs
- **Safety**
 - Maximise natural surveillance
 - Maintaining Opening
 - Balconies/Open Corridors
- **Parking placement**
 - Parking At Rear
 - Parking To Have Active and Surveillance Edges



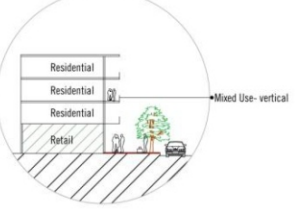
3. NON MOTORISED TRANSPORT

- **Pedestrian priority**
 - Design to Pedestrian Scale
 - Safe Streets Programme
- **Dedicated Systems**
 - User needs and function
 - Create Defined Systems



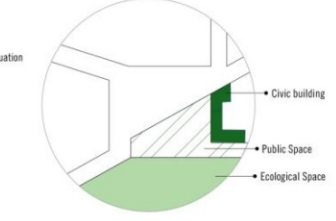
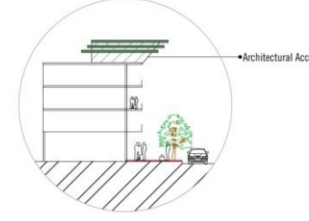
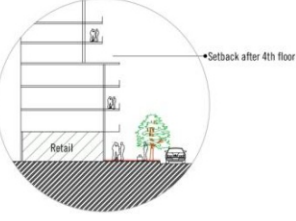
4. ACTIVE RESPONSE

- **Mixed Use**
 - Promote Vertical Mixed use in Buildings
 - Markets at Interceptory points
- **Active Base**
 - Mandatory Active base
 - Double volume base- to reinforce activity
- **Active space**
 - Mixed Use spaces at PT stops/ intersections
 - Main activity corridors- linear spaces



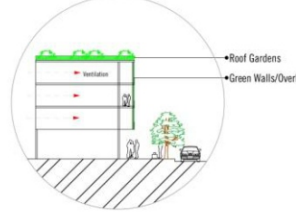
5. PLACE MAKING + PUBLIC ENVIRONMENT

- **Human Scale**
 - Responsive Street Edge
 - Setback after 4th floor
- **Legibility**
 - Definition of Streetscape elements
 - Focal Buildings/corners
 - Capital Web Structure
- **Public Space + Structure**
 - Hierarchy of spaces connecting Capital web
 - Hard Spaces and Active places- Civic
 - Ecological spaces



6. SUSTAINABILITY + RESILIENCE

- **Climatic Response**
 - Orient buildings to maximise performance
 - Solar protection (east + west)
- **Efficiency**
 - Northern aspect for Natural light
 - Natural Cooling systems
- **Green Infrastructure**
 - Vertical Gardens as solar protection
 - Green roofs- cooling+ Bio diversity
- **Harnessing nature**
 - Sunlight - Solar panels
 - Rain water harvesting

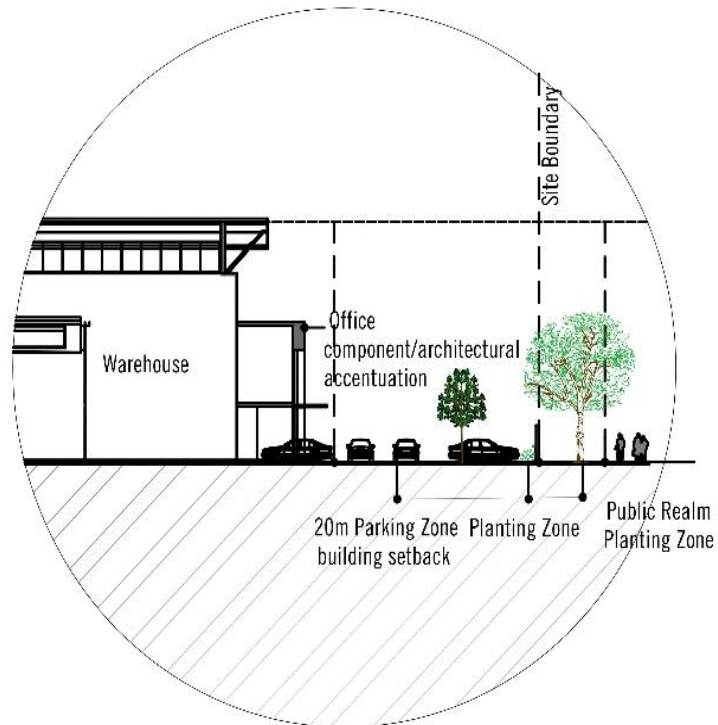


7. URBAN MANAGEMENT

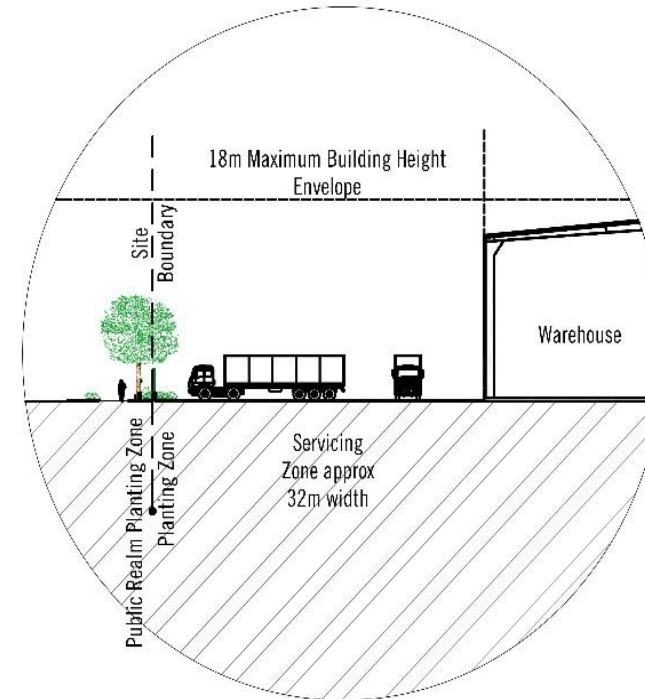
- **Precinct Planning**
 - Guideline Plan- Developer + Municipality
 - Detail landscaping and Site Development Plans
- **Design Review**
 - Design Review to manage development within precinct
 - Set up structures
- **Maintenance and Precinct management**
 - Ongoing Maintenance/urban management
 - Precinct manager to co-ordinate development

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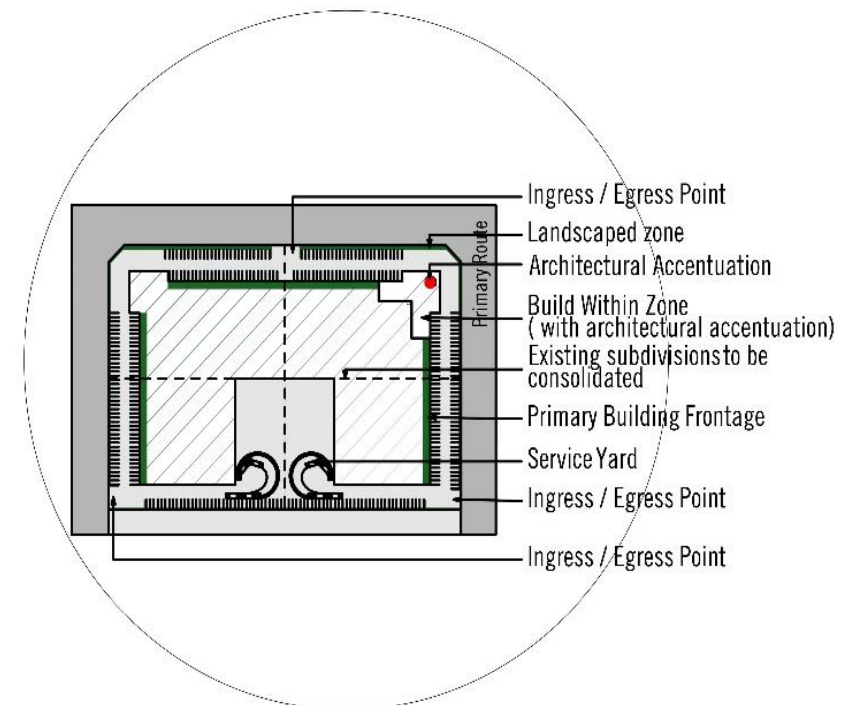
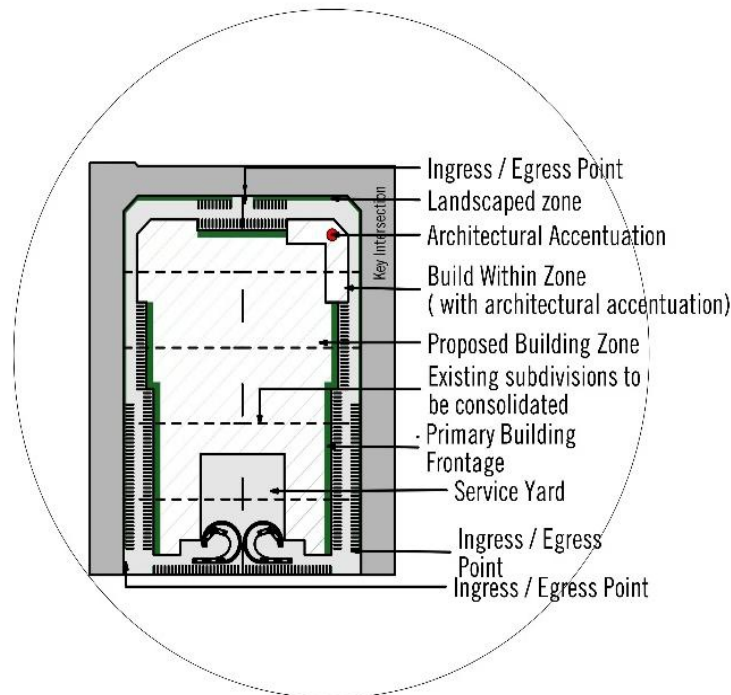
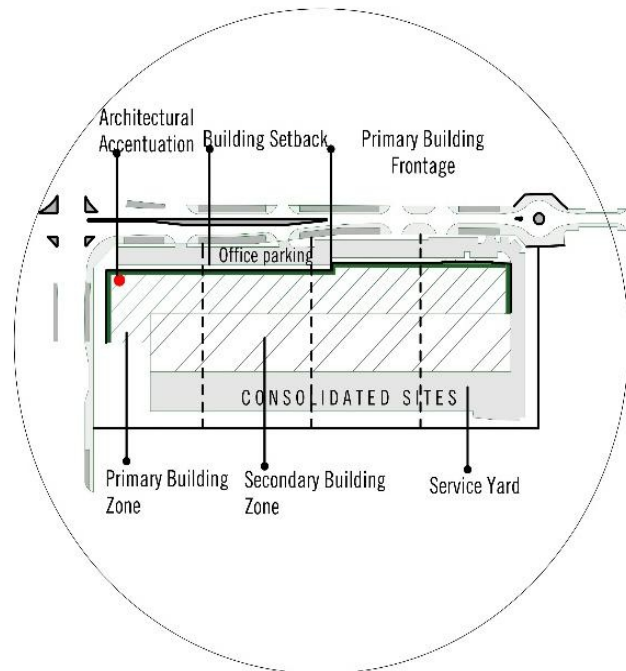
1) FRONT FACADE



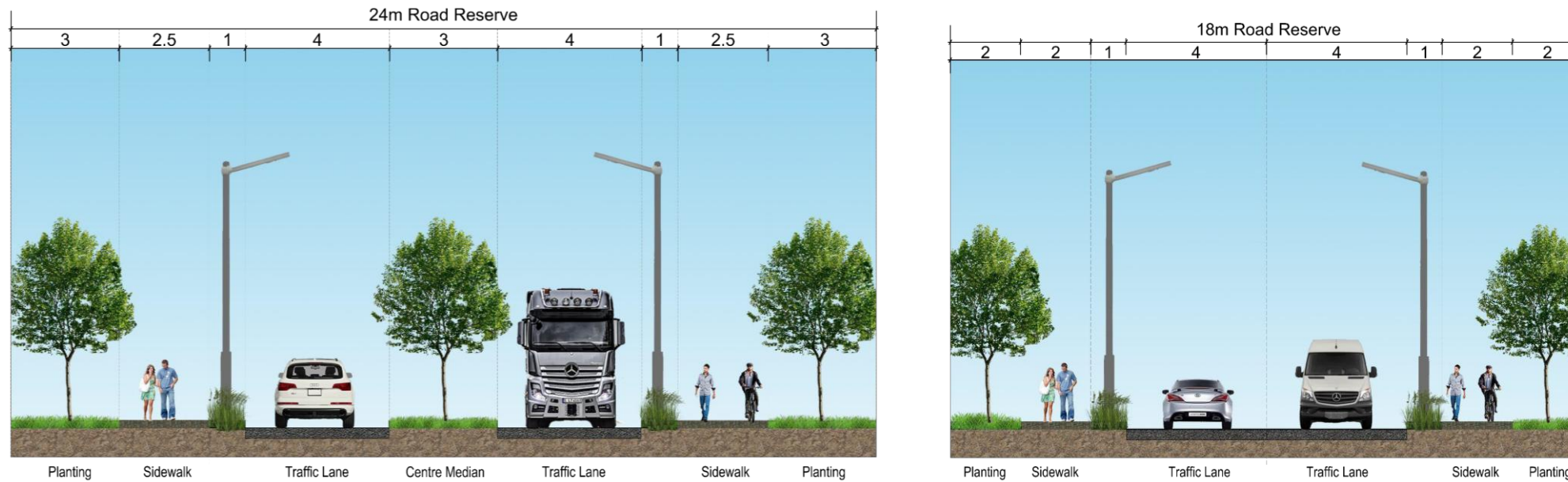
2) REAR FACADE



3) POSSIBLE CONSOLIDATION OF SITES



Kazungula Logistics Park Precinct Plan Guidelines



TYPICAL SITE LAYOUT

KAZUNGULA LOGISTICS PARK CIVIL ENGINEERING GUIDELINES

A) General

This area is demarcated by the Kazungula – Francistown Road to the west and the Kazungula – Zimbabwe Border Road to the north east. The general ground fall is from the western side of the area to the north east side of the area. The ground falls from approximately 970 masl to 930 masl. The proposed railway line from Botswana to Zambia is earmarked to traverse the southern boundary of the project area. The exact alignment of the railway line in the vicinity of the project area is not known at this stage. However, this will have an impact on the project area especially with regards to the storm water drainage management of the area.

B) Bush Clearing and Topsoil Retention

There should be very strict guidelines set for this operation during the implementation stage as otherwise the site will be barren of any large indigenous trees. The following aspects have to be put in place to safe guard the site.

- a) Whilst the initial topographical survey of the site is being carried out, all large trees (say a girth of more than 1m) will have to be identified and surveyed.
- b) These identified large trees will need to be physically marked on site and the contract documents prepared should clearly state the penalty for the destruction of such marked trees.
- c) Should there be the need to modify slightly any road alignments or service alignments due to the presence of these large trees, then the designs should be flexible to accommodate these minor changes.
- d) All trees that are eventually cleared for the development areas should be cut and stacked in to suitable lengths (say 400mm) for the use by the local residents.
- e) The removal of topsoil should be kept to a bare minimum, say 150mm in depth. It should be stockpiled in a neat manner for later re-use for landscaping.

C) Road Network and Vehicular/Pedestrian Interactions

The road network in the project area requires careful consideration as it entails the provision of a fairly extensive Truck Stop and Distribution centre together with a Logistics Park, Commercial Area and a Police Station. The access to the Truck Stop is planned to be off the main Kazungula – Francistown Road and from an easterly direction through the proposed Logistics Park. This principle will require further refinement.

It is also envisaged that, there will be rail spur into the Truck Stop area off the proposed main railway line. This too will have implications of vehicular movements within the Truck Stop area.

The following aspects need to be taken cognisance of during the design and implementation stages.

- a) The access points to the proposed Truck Stop area off the main Francistown road.
- b) The access points from the Logistics Park into the Truck Stop area.
- c) Adequate acceleration and deceleration lanes to be provided for the Truck Stop area access off the Francistown Road in line with normal design principles for a 60 kmph design speed.
- d) Adequate attention be given to the turning radii required by Heavy Goods Vehicles (HGV's) and HGV's with trailers at the access point off the Francistown Road.
- e) The paving recommended for the Truck Stop Area is 80 mm thick, 30 Mpa Interlocking Pavers laid on a 30mm bed of river sand after the preparation of the Bulk Earthworks, Selected Sub Grade, Sub Base and the Base to the prescribed standards as recommended by the latest Botswana Roads Department Design Manual. Ideally the Base should be crushed stone base.
- f) The parking bays within the Truck Stop area should be designed in accordance with the internationally stipulated standards for HGV's.
- g) The turning radii within the Truck Stop area should cater for HGV's and HGV's with trailers.
- h) All junctions within the project area should be controlled by either "4 way" or "3 way" STOP Signs. This is by far the safest mode of traffic control for the project area.
- i) All pedestrian crossings should be raised at least 100mm above the finished road level and be at least 2m wide and be constructed of Interlocking Block Paving, red in colour. This will then act as a traffic calming measure and will also alert the driver to the need to reduce speed when approaching the pedestrian crossing point.

j) The internal roads in the project area should ideally comprise of the following :

- Bulk Earthworks; compacted to 90% MOD AASHTO density; minimum CBR = 3%
 - Selected Sub Grade; compacted to 93% MOD AASHTO density; minimum CBR = 15%
 - Sub Base; compacted to 95% MOD AASHTO density; minimum CBR = 45%
 - Base; compacted to 98% MOD AASHTO density; minimum CBR = 80%
 - Surfacing.
- k) It is preferable that, naturally occurring gravels that comply with the Roads Department Specifications are used for the bulk earthworks, selected sub grade, sub base and the base.
 - l) There are options available for the surfacing of the roads. These are a double seal surfacing, a cape seal, pre mix asphalt or interlocking block paving. The choice will be dependent upon the capital cost, maintenance cost and the location of its use.
 - m) It is recommended that all intersections within the project area be finished off with 80mm thick, 30 Mpa Interlocking Block Pavers which are red in colour up to the radii points of the intersections. This will reduce the effect of raveling and rutting that is generally associated with the turning movements and braking of HGV's at intersections.
 - n) It is also imperative that the finished road levels are only slightly above existing ground level; say a maximum of 300mm. The vertical alignment of the roads should adopt the philosophy of a "rolling grade" scenario. This is to ensure that the road's vertical alignment follows the natural ground profile as best as possible to avoid excessive fills and cuts and also to ensure that the road side drainage is not excessively deep which otherwise will be a hazard to pedestrians. Shallow road side drains also assist in the provision of easier plot accesses across any road side drains.
 - o) It is recommended that all block paved roadways and other paved areas are treated with weedicide prior to the laying of such.
 - p) All road signs and road markings should be in accordance with the latest SADCC Road Signs Manual.

D) Storm Water Drainage Network

In developing design guidelines and principles for the storm water drainage network for the site, the existing terrain and any proposed future developments such as the proposed railway line on the southern boundary of the site will have an impact on the storm water drainage network within the site.

As stated earlier the site falls from the western side of the site (i.e. from the main Francistown Road) to the north eastern side of the site (i.e. towards the Zimbabwe Border Road) and ultimately drains in to a flood plain bounded by the two main roads that lead towards the ferry border and the road border. This flood plain is made up of "black cotton" soils and retains water during the rainy season and it ultimately discharges in to the Chobe River. It is also a location that is frequented by wildlife on a regular basis.

Taking cognisance of the above known factors the following design guidelines are proposed.

- a) Ascertain the alignment of the railway line as soon as feasible.
- b) Provide a main cut off drain commencing from the Francistown Road on the western side of the site that traverses along the southern boundary of the site; this cut off drain should be positioned between the proposed railway line and the southern boundary of the site. This will ensure that, any storm water is collected outside the site and thus reduce the sizes of the internal drainage network.
- c) The outlet to the above mentioned cut off drain will need to cross the road to the Zimbabwe border with a suitably sized culvert that will drain in to the existing flood plain.
- d) The main cut off drain and the internal drainage network should be designed utilizing the Standard Rational Drainage Design Method and be in accordance with the Botswana Road Design Manual requirements and parameters.
- e) The design parameters that should be considered and taken cognisance of in designing the drain/channel sizes are the following.
 - Historical Rainfall Figures
 - Average Annual Rainfall for the area
 - Contributing Catchment Area
 - Rainfall Return Periods
 - Rainfall Intensity
 Parameters that take in to account the gradient of the ground, the type of vegetation in the catchment area and the soil type in the catchment area.

KAZUNGULA LOGISTICS PARK CIVIL ENGINEERING GUIDELINES

f) Ideally the main cut off drain should be lined using either concrete or stone pitching. Stone pitching being more labour intensive and thus will create employment for the local residents of the area.

g) The main cut off drain will have a fall of approximately 40m over its length and will hence require the provision of erosion control measures along its length in order to reduce the flow velocity. These measures can be achieved by providing "bolsters" spaced in accordance with the gradient of the drain section under consideration. For very steep grades the "bolster" spacing will be smaller compared to flatter grades.

h) The internal drainage network can be either lined channels or covered channels. They both have their own advantages and disadvantages which will need to be taken cognisance of in the final designs.

i) It is also recommended that, debris traps be provided at suitable locations within the storm water drainage network. They should be positioned at locations which are easy to access for cleaning purposes. This will ultimately reduce the flow of rubbish in to the Chobe River.

j) It is also recommended that, the provision of oil/fuel interceptors within the drainage network prior to final discharge should be considered. This too will reduce the risk of polluting the Chobe River.

k) All culverts should be either circular/rectangular precast concrete which are readily available in the country.

l) All culverts should be provided with headwalls, wing walls and aprons on the inlet and outlet sides.

m) Stone pitching should be provided at culvert inlets and outlets to prevent eroding the earth embankments.

n) To encourage storm water collection within individual plots for re-use within the plot.

o) The provision of road side furniture to indicate the presence of underground culverts as per the Botswana Road Design Manual is recommended.

E) Water Supply

The provision of the bulk water supply for the project site is the responsibility of the Water Utilities Corporation (WUC). Hence all matters that relate to the water consumption and reticulation within the project area will have to be in accordance with the latest WUC Design Guidelines. It is also the practice that, all designs together with the relevant drawings are submitted to WUC for approval prior to any final implementation of the work.

Given the current water shortage and drought conditions that the entire Southern African region is experiencing it is quite possible that, WUC may

enforce more stringent measures to curb the excessive use of water in the country as a whole.

It is advisable that regular checks are made with WUC to ensure that, the latest design guidelines of WUC are used during the detailed design stage. This will ensure that, the correct prescribed water consumption figures are used for the various developmental categories when undertaking the detailed designs for the project.

A similar scenario applies to the provision of water for fire fighting purposes. The guidelines prescribed by WUC have to be complied with.

The following are some of the key design standards that are applicable.

Minimum Pressure Head = 15m (1.5 bar) at the water meter, where the design of the reticulation is based on peak hourly on a peak day flow. The minimum head is in general sufficient for up to/including three-storey development. In the early years of a development it is likely that minimum heads will exceed the 15m, but could fall with time and development to that figure. **The developer responsible for the design of internal reticulation systems within the various plots who do not take account of this like hood will be held responsible for any problems encountered in the future regarding inadequate pressure.**

Peak Factors. Refer to Table 3.1 of the WUC Design Manual.

•Unit Consumption. Refer to Section 3.2 of the WUC Design Manual.

•Residual Pressure Heads under Peak Hour Flow Conditions. This will be 15m for all consumers and generally can be achieved if a minimum pressure head of 16.5m at the nodes is allowed for at the design stage.

•Maximum Velocity in Network = 1.0m/s

•Minimum Velocity in Network = 0.3m/s

•Pipeline Friction Factors. Refer to Section 3.5 of the WUC Design Manual.

Water Losses. The losses within pressure zone networks should be assumed to be 15% for design purposes.

Design Demand = Theoretical Demand/0.85

•Reticulation and Position of Water Pipes. The position of the water pipe within the road reserve is dependent on other services. The water pipe is normally situated on the opposite side of the road to storm water drainage and any sewer pipe. Refer to Section 5 of the WUC Design Manual.

•Fire Fighting Flows. Refer to Section 14 of the WUC Design Manual.

F) Sewer Reticulation

The provision of a functional and cost effective sewer reticulation system is vital. The prevailing ground fall is to the south eastern side of the project site. The lowest point on the site is located at the extreme south eastern side.

Due to the terrain of the project site, it is envisaged that a raw sewage pump station would be required at the lowest point on the site.

The sewer reticulation design and implementation should take cognisance of the following together with the standards stipulated in the Botswana National Wastewater and Sanitation Planning and Design Manual.

a) The waste water volumes that need to be catered for would be totally based on the initial water consumption figures for the various localities within the project site as prescribed by the WUC.

b) Daily volumes of waste water anticipated should be calculated using the prescribed peak flow factors.

c) Careful assumptions will have to be made on the percentage of water used which will be returned to the proposed sewer system, which in turn will dictate to the quantity of sewage that needs to be reticulated.

d) All sewers should be designed in such a manner that a minimum self cleansing velocity of 1.0m/sec is maintained throughout the system to prevent blockages.

e) The spacing of manholes should be such that they do not exceed the local council's rodding capability. This is normally restricted to about 50m. Manholes should be provided at all changes in direction and at all connection points. Direct plot connections to the sewer pipes should be avoided as much as possible.

f) All sewer pipes (gravity and pressure) should be upvc.

g) The depths of sewers should be at least 600mm below ground level.

h) All top of all manholes should be finished off at least 150mm above surrounding ground level.

i) The minimum diameter for a gravity sewer should be 150mm.

j) The minimum diameter for individual plot connections should be 100mm.

k) Inspection chambers and rodding eyes should be provided at all sewer junctions within plots.

l) The sewers should be positioned either in a mid block fashion or at the back of the plots.

m) Any proposed raw sewage pump station should have the following aspects incorporated in to the

•The pump station should be designed in such a manner that it has a wet well and a dry well.

•All pumps should be located in the dry well and be below surrounding ground level.

•A screening mechanism should be provided on the inlet side of the pump station.

•A collection system should be provided to collect the screenings. The simplest form would be a skip.

•The pump station size will be dependent upon the flow volumes, the number of stop/starts per day for the pumps and the invert levels of the sewers coming into the pump station.

•The wet well of the pump station should be provided with float switches to control the stop/starts of the pumps.

•The pumps provided should be of a similar type that the local council is experienced to ensure regular maintenance and the availability of spares.

•A water supply should be provided to the pump station site.

•A mains power supply together with a backup power supply should be provided.

•The pump station site should be fenced and gated. Additional protection should be provided to ensure that wildlife is kept away from the pump station site by creating a buffer of at least 6m outside the fence.

•Adequate lighting should be provided with an emergency alarm system.

•Adequate paved parking area.

•The provision of a simple to use maintenance manual which should have daily, weekly, monthly and quarterly maintenance check lists. The manual should also have information pertaining to the various contractors, and suppliers of the various mechanical and electrical components of the system. Ideally the manual should be in Setswana and English.

n) All raw sewage pressure pipes (rising mains) should be adequately sized to cater for the anticipated sewage volumes that require pumping and the pressure ratings for the pipes are designed accordingly. The spillage of raw sewage into the environment should not be permitted.

o) All raw sewage pressure pipeline routes should be easily identifiable. Suitable marker posts are to be provided along the route of the pipeline.

p) The raw sewage pressure pipes should be lead into the nearest existing council sewer via a break pressure tank or if feasible into the council's treatment ponds.

KAZUNGULA GATEWAY JUNCTION PRECINCT

GENERAL ETHOS

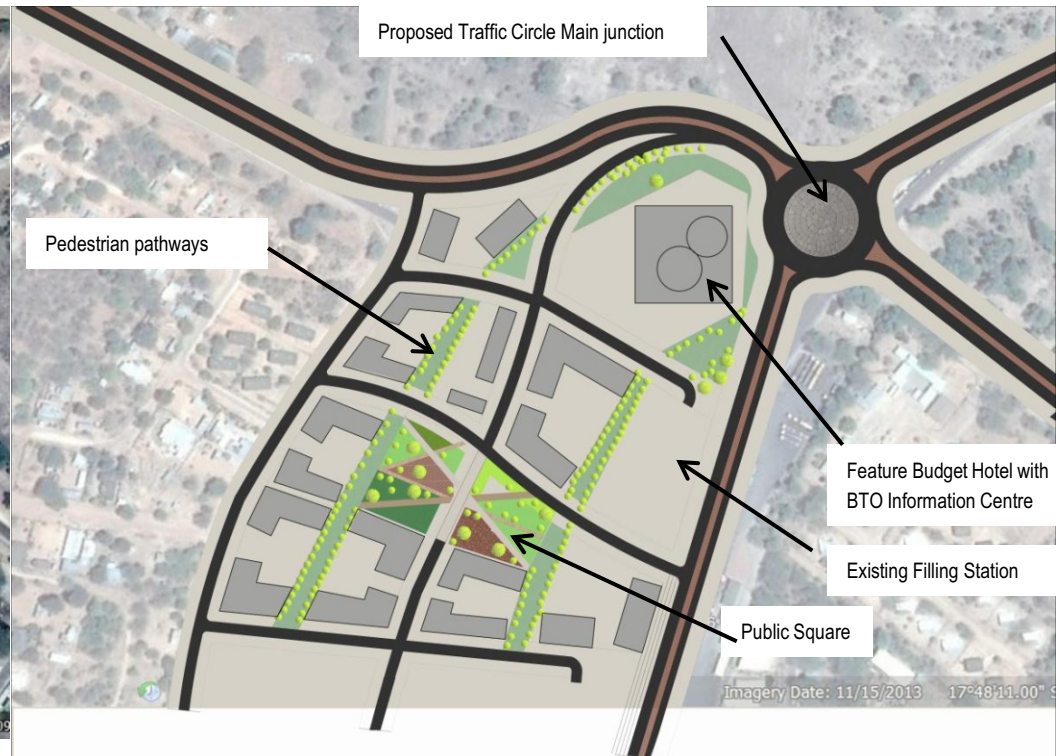
It is envisioned that The Logistics park will come with a demand for more decent budget accommodation options for business personnel. As such, the framework also makes proposals for a Gateway Precinct that will locate a Road Lodge and retail/market development opportunity as well as multiple blocks of office/retail/residential mixed use.

This proposed development will be anchored by a budget hotel building, about six storeys tall. It will frame the junction as a gateway to Kasane along A33. The development will draw in tourists by providing a major Botswana Tourism Organisation tourist information centre.

The gateway precinct is defined by a new, very large traffic circle that brings all traffic together to one focal point. The proposal removes the existing staggered junctions to create a major one. The gateway traffic circle will have a dominant landscape feature at its centre surrounded by landscaped island. There will be a network of pedestrian pathway linking the new circle, proposed budget hotel, a proposed urban square and terminating at the existing Borogo junction mall. The square sits in the middle of a office/residential mixed use and will have an amphitheatre and can be used for hosting events to activate the space.



CURRENT SITUATION BEFORE PROPOSAL

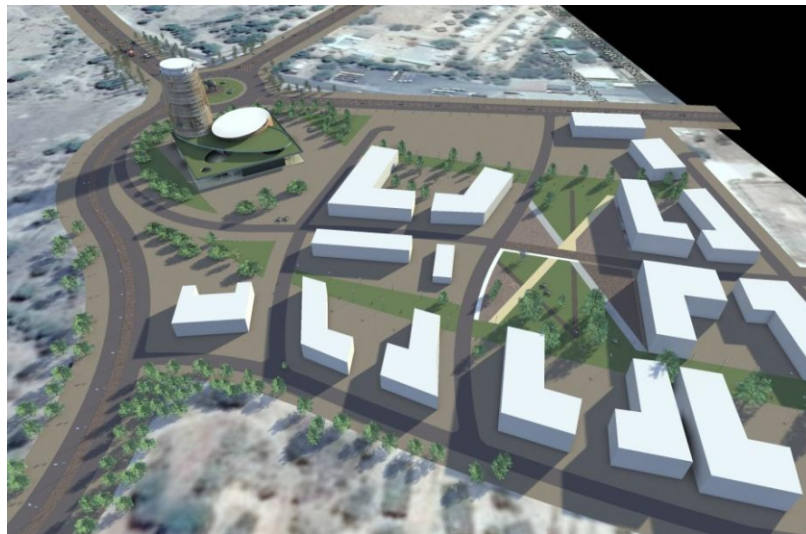


PROPOSED GATEWAY JUNCTION AND PLAN

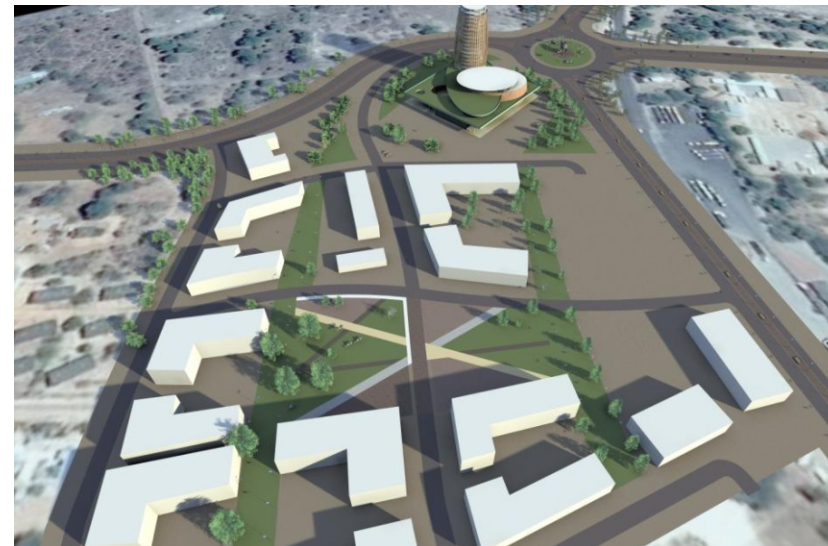
**KAZUNGULA GATEWAY
JUNCTION PRECINCT ILLUSTRATIONS**



Feature Budget Hotel with BTO Information Centre



Urban Form of the new Kazungula Gateway Junction



Urban Form of the new Kazungula Gateway Junction

WILDLIFE CROSSING POINTS

GENERAL ETHOS

The purpose of this crossing is to stop vehicles from interfering with wildlife migration paths where they cross. The two possible wildlife crossing points are located at points marked 'ANIMAL CORRIDOR' on the Kazungula Urban Vision on page 55.

A possible bridge structure that separates wildlife and vehicles at the crossing points could look similar to the image below.

RECOMMENDATION

It is recommended that a specialist Feasibility study be undertaken to evaluate the proposal for a grade separated wildlife crossing at the two located points highlighted in the map below. Key components of the feasibility study shall be the impact on wildlife as well as the engineering and costs evaluation.



Example of a typical wildlife bridge

RETIREMENT AND HOLIDAY HOMES

RETIREMENT AND HOLIDAY HOMES GENERAL ETHOS

Holiday homes and Retirement villages are proposed in this area to continue the principle of toning down urban commercial and industrial activity and promoting more calmer uses that can complement ecological character of wildlife presence and movement in the area. These proposals were also made in response to the demand for such facilities, as brought up in the design charrette during preliminary design phase.

This area was envisioned as the part of town requiring less urbanisation and as a result, considering that people who would want to reside or invest in retirement villages or holiday homes, desire some level of peace and quiet, it is viewed as the ideal location for these uses.

The existing lodge accommodation facilities in the area will maintain their use or be allowed to change use to the proposed uses, because both uses are complementary.

Note; There is no fixed layout plan for this proposal other than as contained in the Kazungula Urban Vision. It is anticipated that this proposal will evolve over a long time and its layout can not be detailed and fixed at this time other than the guidelines in the table below.

CATEGORY	RECOMMENDED GUIDELINES			
	A) BUILDING HEIGHT LIMIT	B) BUILDING SETBACKS	C) PARKING REQUIREMENTS	D) SPECIAL CONCESSIONS
<u>Retirement Homes and Holiday Homes</u>	<u>Maximum 2 storey</u>	FRONT - 8metres SIDE and REAR - 5metres (setbacks are generous to achieve the privacy sought after by holiday makers)	-	<ol style="list-style-type: none"> 1. Colour – Unless otherwise stated by the Design Review Panel , only Earthy colours of materials and paint shall be used on buildings along the river edge. The purpose is to eliminate possibility of visually offensive colours in the development. 2. Façade treatment and Materials. - Building façades should be textured with appropriate indigenous material to the approval of Design Review Panel. 5. Roof – The use of exposed Galvanised Roof Sheets is prohibited. Other roofing materials and styles are subject to approval of the Design Review Panel. 6. Boundary wall- Boundary walls are prohibited in front. -a) Solid wall or palisade fence may be built along whole length of the side plot boundaries. b) Side walls may be built on the side of the building to the side boundary wall for privacy and security. c) Height of Boundary wall is 1.5metres

Applicable Environmental Design Standards for Kazungula Retirement and Holiday Homes.

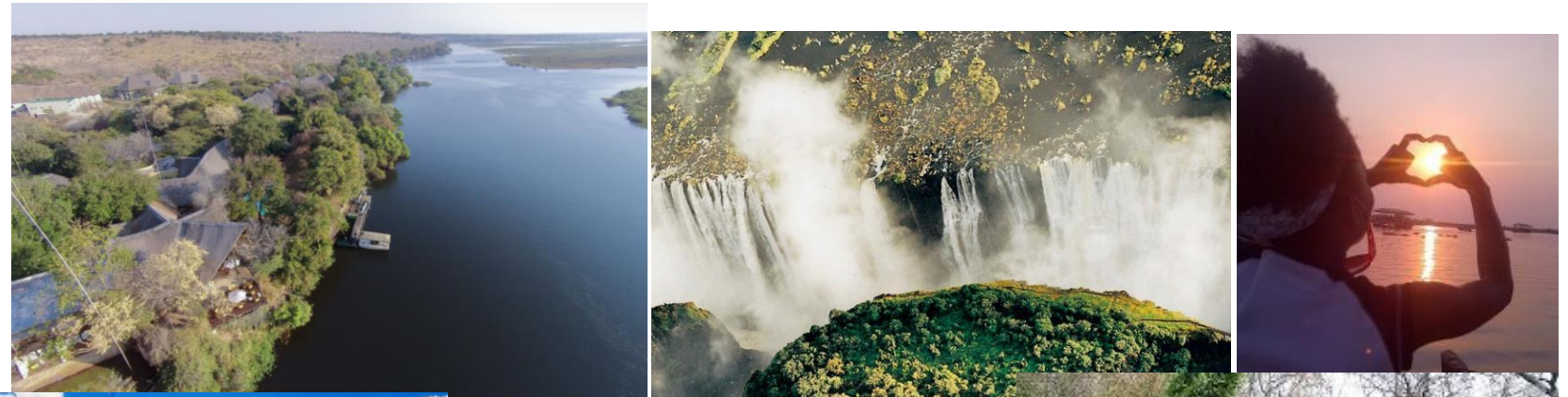
Indoor Env Quality GS1: GS1: All General Standards under GS1 shall be applicable to this development	Energy Efficiency GS2: GS2: All General Standards under GS2 shall be applicable to this development .	Water Efficiency GS3: GS3: All General Standards under GS3 shall be applicable to this development	Land Use and Ecology GS4: GS4: All General Standards under GS4 shall be applicable to this development	Materials GS5: GS5: All General Standards under GS4 shall be applicable to this development	Transport GS6: GS6: All General Standards under GS4 shall be applicable to this development	Emissions GS7: GS7: All General Standards under GS4 shall be applicable to this development
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08 DESIGN PALETTE

8.1 CONTEXT

Kasane and Kazungula environment have a distinct character that to a great extent have influenced the spatial planning aspect of this project and the material, colour and textures that form the basis for the Urban Design guidelines.

The following pictures highlight the characters of various key locations within the study area collected from various sources. These images form the basis for the design palette that is presented next at chapter 8.2 of this Manual.



8.2 PROPOSED DESIGN PALETTE



05 IMPLEMENTATION

5.1 Design Review Process

The aim of the Design Review process is to provide guidance to Developers and their design professionals to ensure that the development potential and real estate value of the overall site is maintained. The design code requires a strong cohesive statement to be made by the development as a whole and the necessary architectural excellence to ensure that these objectives are achieved.

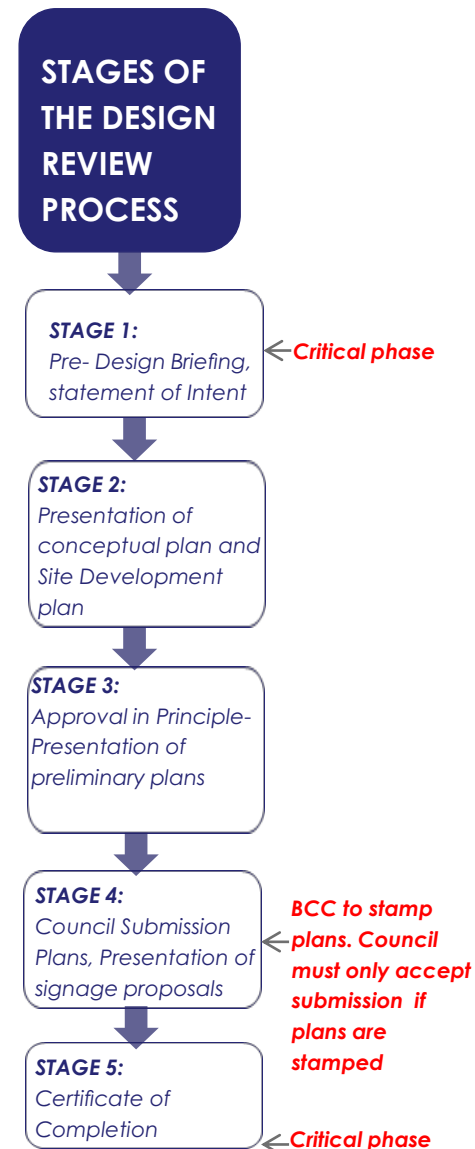
The purpose of the design code is to create an overall integrity to the development.

Following consultation with the Design Review Panel the municipality may, from time to time, make additions or amendments to the Design guidelines document

5.2 Stages of the Design Review Process

STAGE 1: PRE-DESIGN BRIEFING AND STATEMENT OF INTENT

Before any design is initiated the Developer & his/her professional team may wish to meet with the Building Control Committee to clarify design objectives, property characteristics and technical issues outlined in the Precinct Plan and Development manual. This is a critical phase of the process and it is highly recommended that the secondary developer/architect engage with the professional team in order to establish the design parameters, intent for the development, prior to starting any design concept. The professionals in most cases choose to rely solely on the precinct plan and in some cases misunderstand, or apply the guidelines incorrectly. By engaging earlier on in the process, undue expenditure and time can be saved. It is obligatory that the building is designed by a registered Architect providing a full service in terms of the appropriate professional registration.



STAGE 2: PRESENTATION OF A CONCEPTUAL DESIGN AND A SITE DEVELOPMENT PLAN

Each Site Development Plan shall include –
The planning controls applicable to the site - site area, FAR, coverage, building heights, building lines, boundary dimensions, servitudes;
The building envelope laid out on the site with the uses clearly identified and demarcated together with the total area of each component with the number of parking bays required;

STAGE 3: PRESENTATION OF PRELIMINARY PLANS PRESENTED FOR APPROVAL IN PRINCIPLE FROM CHOBE BCC

A detailed preliminary plans should include plans, sections and elevations at a minimum scale of 1:100 together with a site plan at 1:200. Details regarding external materials, colours, landscaping, site services, earthworks, lighting, parking areas (including paraplegic parking and access)and parking area and pathway finishes; Indication of areas for signage.
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STAGE 4: COUNCIL SUBMISSION PLANS

The applicant is to submit Council submission plans which are to be perused and signed off by the BCC Review Panel prior to submission to Council. This submission is to include an Energy Report outlining the methods utilised to conserve energy and an indication of how stormwater storage and runoff is to be dealt with. The applicable Green Design requirements and calculations should be submitted at this stage.

STAGE 5. CERTIFICATE OF COMPLETION

After inspection of the completed development including installation of landscaping, signage and lighting, approved by the BCC, a certificate of "Final Approval" will be issued. This is a very critical stage as the secondary developer will not be able to receive the 'certificate of occupation" without the final approval of the BCC. The BCC would need to ensure that no additional deviations have been undertaken without their consent or if the development has deviated from the approved plans.

5.3 Environmental Design Standards – Submittals

Unless otherwise specified in the standard or adequately illustrated by standard documentation for application for planning and building, additional information shall be submitted to the local authority, by the developer, in accordance with the table below;

Category	Reference	Description	Submittals
Indoor Environmental Quality GS 1	GS1-1-1	Ventilation and Air Change	Design details of the HVAC and specified outside air rates of the AHU for the occupied spaces
	GS1-1-4 and GS1-1-5	Humidity control and extraction of fumes/gases	Design details and specifications of the HVAC system
	GS1-1-2	Ventilation and Air Change	Architectural drawings showing and schedule of occupied spaces, floor areas, ventilation strategy, location and areas of ventilation openings.
	GS1-2-1	Day-lighting	Day-lighting modeling or manual calculation of Day-light factor or illumination levels (lux values) at centre of room for all occupied spaces.
	GS1-4-2	Acoustics	Calculations of reverberation time and a schedule of specifications of materials and their Noise Reduction Coefficient confirmed by the manufacturer's data bulletin.
	GS1-5	Ambience	Illustration in the window schedule of the areas and percentages
Energy Efficiency GS 2	GS2-1	Envelope Thermal Transfer Value (ETTV)	Calculations of ETTV, attachments of the schedule of areas of components of the building envelope, elevations and roof plans
	GS2-1-1	U Values	Specifications of materials, sections of typical building envelope components, R values and combined U value of the building envelope component.
	GS2-2-2	Thermal Gradient and condensation	Illustration of Thermal Gradient with R values of the components of the building envelope and section drawn to scale
	GS2-4	Site layout and Planning	Site-plan and floor plans to a scale suitable to read the different materials and spaces
	GS2-5-1, 2	Sun Control	Design details of the sun shading device and projection of shadow mask on the sun path diagram and in relation to the cut-off period specified in the guidelines and overheating period.
	GS2-5-3, 4	Artificial lighting	Calculation of Lighting Power Densities, lighting layout and specifications of lighting fixtures. Computer modeling report for combined daylight and artificial lighting if applicable.
Water Efficiency GS 3	GS3-2	Water recycling	Submission at practical completion and quarterly submission of tests to the local authority during the operational phase of the development.
Land-use and Ecology GS 4	GS4-1-1, 2	Topsoil	Landscaping plan including quantities of topsoil to be removed and used, the demarcated area for its temporary storage and protection
	GS4-2-1, 2	Solar Reflectance Index (SRI) of surfaces	Specifications and landscaping plans with manufacturer's Data Bulletins confirming SRI of material or testing in accordance with the latest ASMT standard
	GS4-2-3	Non-deciduous trees	Specifications and images of plant species at their maturity stage.
	GS4-3-3	Extent of impervious material	Landscaping plan and specifications of materials
	GS4-5-4	Storage of waste	Site plan, ground floor plans and section of building where waste is being stored
Materials GS 5	GS5-1-1	Contaminants and Hazardous Materials	An affidavit provided by the developer to the local authority at practical completion confirming compliance with the standard.
Transport GS 6	GS6-1-1	Parking for Compact Cars	Site plan of the development
	GS6-4-1	Amenities	Building floor plans showing location and layout of room