

Steyn City Properties (Pty) Ltd



PROPOSED TOWNSHIP OF RIVERSIDE VIEW EXTENSION 84

Civil Engineering Outline Scheme Report Rev 2

November 2019



Prepared for:
Steyn City Properties (Pty) Ltd
P O Box 1623
HONEYDEW
2040
Tel: (011) 476 6148
Fax: (011) 476 3902
Attention: Mr Howard Rawlings

Prepared by:
Bigen Africa Services (Pty) Ltd
Real Estate
Allan Cormack Street,
The Innovation Hub, Pretoria, 0087

Contact person: M McGarry Pr Eng
Tel: 012 843 9043
Fax: 012 843 9000/1
Email: michelle.mcgarry@bigenafrica.com



Steyn City Investments (Pty) Ltd

STEYN CITY DEVELOPMENT

RIVERSIDE VIEW EXT 84 OUTLINE SCHEME REPORT REV 2

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Revisions

01: July 2018	Initial Outline Scheme Report
02: Nov 2019	Updated with revised Attenuation Pond Shape

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RIVERSIDE VIEW EXT 84 OUTLINE SCHEME REPORT REV 2

Part A General Matters

Section A1 Project Brief

Bigen Africa Services (Pty) Ltd was appointed by Steyn City Properties (Pty) Ltd to prepare an Outline Scheme Report for civil engineering services in support of the proposed township of Riverside View Extension 84.

The purpose of this report is to provide engineering services comment for the proposed new development with regards to roads, stormwater water and sanitation infrastructure located within the environs of the development site.

Section A2 Town Planning

The composition of the development applied for is “Special” for purposes of Place of instructions, residential buildings and offices, including ancillary uses such as restaurants and shops. The total site area is

The proposed development rights for Riverside View Ext 84 are listed below. A Township Layout Plan is included in Annexure B.

Table A.1.1: Riverside View Ext 84 Proposed Rights

Erven 1 & 2	
Zoning	“Special” for Place of Instructions, Residential buildings and Offices, including ancillary uses such as restaurants and shops
FAR	0.6
Height	4 storeys excluding basements and architectural features
Coverage	As per approved SDP
Density	20 dwelling units / hectare

Parking	As per scheme
Building Line	As per scheme 5m along street boundaries 16m along William Nicol Drive (Provincial route)
General	<ol style="list-style-type: none"> 1. A general Right of Way Servitude to be registered over Erven 1 and 5 in favour of Erf 2 until the water use licence is obtained and access is determined to Erf 2. 2. An SDP to be submitted to the local authority

Erf 3: Special for Access control

Erf 4: Special for Private Roads

Erf 5: Private Open Space

Table B.1.2: Riverside View Ext 84 Land-use Table

Erf Numbers	Zoning & Land-use	No. of Stands	Area of Stands & Streets (ha)
1, 2	“Special” for Place of Instructions, Residential buildings and Offices, including ancillary uses such as restaurants and shops	2	19.235
3	Special for access control	1	0.291
4	Special for private road	1	0.937
5	Private Open Space	1	5.107
Total		5	25.57

Section A3 Design Guidelines and Philosophy

The Local Authority uses mainly their own standards in combination with publications of which the relevant one’s are listed in A3 overleaf, as design guidelines with variations to ensure that the most efficient civil engineering services are provided at the lowest long term cost.

The design philosophy is that services should be provided at a level and cost affordable to the beneficiaries keeping in mind the nature of the site. The long term cost is the determining factor, i.e. including the cost of maintaining services when a suitable level is considered.

Table A3: Design Guidelines

Guideline Reference	Title
A	“Guidelines and standards for the design and maintenance of water and sanitation services”, published by the Investment Delivery Division of Johannesburg Water (Pty) Ltd
B	Johannesburg Roads Agency (Pty) Ltd: Guidelines on the Planning and Design of Township Roads and Stormwater Drainage
C	“Guidelines for the provision of engineering services and amenities in residential township development”, issued by The Department of Housing in collaboration with The National Housing Board 1995.
D	The Standardized Specification for Civil Engineering Construction (SABS 1200), published by the South Africa Bureau of Standards

Part B Natural Environment

Section B1 Locality

The Site of approximately 25.57 hectares is located in the north of Johannesburg within the City of Johannesburg's Region A. The Site is located between the Developments of Steyn City, Riverside View and Riversands.

The Site is bound by a Provincial Road (William Nicol Drive, R511) to the east, Porcupine Avenue to the north, Zeven Road to the south and View Road to the west. A locality plan is attached in Annexure A.

Section B2 Topography and Surveys

The Site is located between approximately 1422m and 1392m above sea level. The general slope direction is towards the north with an elevation difference of 30m with an average gradient of 1: 20 sloping towards a natural low point located to the north of the site.

Section B3 Environmental Issues

The Site is affected by a defined Wetland as indicated on the Township Layout plan included in Annexure B. The Wetland Survey indicates that restrictions be kept to a minimum as these areas are saturated from time to time. For further information related to the Wetland the associated Buffer Zone please refer to documentation prepared by Messers. Prism Environmental Management Services. The wetland area can be seen in the image below.



Section B4 Geotechnical Issues

A geotechnical site investigation was undertaken by Mr J Louis van Rooy in 2010, the results of which are presented in the “*Report on Phase 1 Geotechnical Site Investigation on Portion 185 and 124 of the farm Diepsloot 388-JR, Johannesburg, Gauteng Province. December 2010*”

The major geological factors that may influence residential development are the following:

- Thin collapsible/compressible soil horizons
- Seasonal shallow ground water and/or perched groundwater tables and/or surface seepage
- Intermediate erodibility of surficial soil horizons
- Difficult excavation conditions below 0.5m
- Flooding in the gully running through the eastern part of the investigated site.
- Special attention should be given to surface water and ground water drainage
- The site soils will not be suitable as fill and bedding for pipelines due to poor grading, but the upper gravelly materials may be suitable for subgrade and subbase road layers and embankments.

Section B5 Integrated Development and Planning Issues

Section B 5.1 Layout Planning

The Site is affected by several servitudes that should be taken into account during the preparation of the Site Development Plan. A Site Development Plan will be required as part of the Development Rights.

- Right of Way Servitude S.G 4898/2014: This includes Porcupine Avenue as well as the existing temporary deviation of Porcupine Avenue. This deviation will be in effect until the completion of the construction of the proposed Rose Road Interchange.
- Electric Power Transmission Servitude 1021/1955: existing overhead powerlines located to the south of the Site
- Proposed new overhead powerline servitude located along the Site's northern boundary.

Part C Engineering Services

Section C1 Water Supply Scheme

Section C 1.1 Authority and Provider Arrangements

The City of Johannesburg Metropolitan Municipality is in terms of the Water Services Act (Act No. 108 of 1997) the Water Service Authority for the proposed development of Riverside View Extension 84.

As provided for in the above act, the City of Johannesburg entered into an agreement with Johannesburg Water (Pty) Ltd (JW), to fulfil the function of the Water Service Provider in their areas of jurisdiction.

Section C 1.2 Regional Supply

A water reticulation master plan was prepared for the Diepsloot Corridor Development by GLS for Johannesburg Water. Riverside View Ext 84 falls within the Diepsloot Reservoir Supply Zone. The Diepsloot Reservoir is supplied with a connection to the Rand Water supply line (RW33). The higher lying portion of Steyn City (Riverglen Extensions), portions of Riverside View Ext 34 and the proposed Riverside View Ext 84 are to be supplied from the Diepsloot Reservoir via the Dainfern PRV. A portion of the existing Dainfern, Diepsloot South and areas east of the R511 are also supplied from this PRV.

The Water Supply Zones for the Steyn City Development and surrounding precincts are indicated in 1459.10.ZA.05.A059 in Annexure C.

Section C 1.3 Design Norms and Standards

For draw-offs directly into the reticulation a peak factor of 4 will be adopted to determine the instantaneous peak flows (i.e. peak hour demands) anticipated. COJ by-laws relating to fire flow conditions will be adhered to. For residential (low risk) areas a fire flow of 38 l/s (2,300 l/min) is adopted while for industrial (moderate risk) areas a fire flow of 95 l/s (5,750 l/min) is utilised. A minimum hydrant delivery flow of 15 l/s (900 l/min) and 19 l/s (1,150 l/min) is utilised for each respective risk category.

The level of service for this development will be the high service level (level 3) of Johannesburg Water's Service delivery options. This service consists of a metered house connection to each residential 3 stand and is classified as service level 4 in the 'Guidelines for the Provision of Engineering Services and Amenities in Township Development' (Red Book). The water design standards were also taken from Table A3 Reference A and are summarised in Table C1.3.

TABLE C1.3: Water Design Standards

	PARAMETER	ELEMENT	GUIDELINE
1.	Level of Service (High)	Water connection per unit	-
2.	Pressure	Maximum (Static) Minimum (at peak flow)	9,0 bar 2,0 bar
3.	Maximum Flow Velocities	dia ≤150 mm dia ≥ 200 mm	1,0 m/s – 3,5 m/s 1,5 m/s – 2,5 m/s
4.	Peak Factor	Design peak (calculated using equivalent erven)	4,0 x average annual daily demand
5.	Fire Conditions	Pipe Flow	38 l/s@ 0.7bar for residential 95 l/s @ 1.5bar for business, commercial, industrial 15 l/s
		Hydrant Flow	
		Hydrant spacing	
6.	Pipe Materials	Erf Connections Distribution main ≤ 200mm	HDPE Class 12 uPVC Class 12 with spigot and socketed couplings
7.	Pipe Size	Network Pipes Adjacent house connections House connections across street	110 mm minimum 25mm minimum 32mm minimum 25mm minimum 2-4 stands 32mm minimum
8.	Valves	Type Couplings Closing Spacing	RS valves up to 350mm dia Gate valves over 350mm dia Flanged (Table 1600/3) Counter Clockwise, non rising spindle Maximum 600m, not more than 4 valves to isolate a section
9.	Pipe Location	10.5 m Reserve 13 m Reserve 16 m Reserve 20 m Reserve	1,4 m from erf boundary 2 m from erf boundary 2 m from erf boundary 2 m from erf boundary (All on high side of road reserve)
10.	Cover to pipes	Minimum :Gravel roads Tarred roads and traffic	1 000mm 800mm

	PARAMETER	ELEMENT	GUIDELINE
		areas Other areas Maximum :All areas	600mm 1 500mm
11.	Reservoir Storage Capacity	Gravity - Industrial Gravity – Other Pumped	45 hours 36hours 54 hours

Section C 1.4 Connections to Existing Services and Proposed Water Scheme

In order to supply water to Riverside Extension 84 a connection to the Diepsloot Reservoir Supply zone will be required. This connection should be located downstream of the Dainfern PRV. This link water line, the proposed connection point to the Diepsloot Supply Zone and the proposed supply point for the development are indicated on the Drawing no. 1459.10.ZA.05.A058, attached as Annexure C.

The design and positioning of valves, fire hydrants, PRV valves, chambers and other fittings will be dealt with in the detail design phase. From the connection point a formal water reticulation system will then be constructed within the development, where water connections to individual stands forming the township will be made.

Water pipes construed with the Council Road Reserve will be constructed to Johannesburg Water Design Guidelines and Standards and will be handed over to the Council upon completion. The water reticulation within each stand of the development will remain private and maintained by the registered Body Corporate.

Section C 1.5 Water Demands

The design demands used for the proposed development are summarised in the table below. Based on the proposed zoning and the applicable FSR, various alternatives for the combination of different land-uses are available, for the purposes of this report, a proportional split between each of the proposed land uses has been done to provide a balanced estimate of the demands.

The design of the water reticulation required for the development will accommodate the ultimate demands anticipated. The total average annual daily demand for Riverside View Ext 84 amounts to 0.48 Ml/day, with a peak hour demand total 24.99l/s.

TABLE C1.5: Water Design Demands

Development Erf	Land - use	Area (ha)	Usable Area, (%)	Unit	AADD (Mℓ/day)	Peak Factor	Total PF (ℓ/sec)
Erf 1, 2: "Special" with Place of Instructions, Residential buildings and Offices, including ancillary uses such as restaurants and shops FSR = 0.6	Place of Instruction	19.23	40	20l/pupil/day	0.05	4	2.315
	Residential Buildings (Student Accommodation)		35	0.77kl/100m2/day	0.31	4	16.55
	Administrative Offices		15	0.38kl/100m2/day	0.07	4	3.50
	Shops		7.5	0.28kl/100m2/day	0.02	4	0.86
	Restaurants		2.5	0.85kl/100m2/day	0.05	4	1.30
3	Special for access control	0.291	100	600l/unit	0.0006	4	0.032
4	Special for private road	-	-	-	-	-	-
5	Private Open Space	-	-	-	-	-	-
Total					0.48		24.99

Section C2 Sanitation Scheme

Section C 2.1 Authority and Provider Arrangements

The City of Johannesburg Metropolitan Municipality is in terms of the Water Services Act (Act No. 108 of 1997) the Water Service Authority for the proposed development of Riverside View Extension 84.

As provided for in the above act, the City of Johannesburg entered into an agreement with Johannesburg Water (Pty) Ltd (JW), to fulfil the function of the Water Service Provider in their areas of jurisdiction.

Section C 2.2 Drainage Zones

The proposed Riverside View Extension 84 falls within the Diepsloot North Drainage Zone as described in the JW Masterplan for the Diepsloot Corridor Developments. The site drains towards the existing Bruma Outfall which is located to the north of the site as indicated on the Drawing No. 1459.10.ZA.06.A070 included in Annexure D. The Bruma Outfall Sewer drains towards the Northern Outfall Sewer eventually terminating at the Northern Waste Water Treatment Works. The drainage zones as indicated in the JW Masterplan are indicated in the figure below.

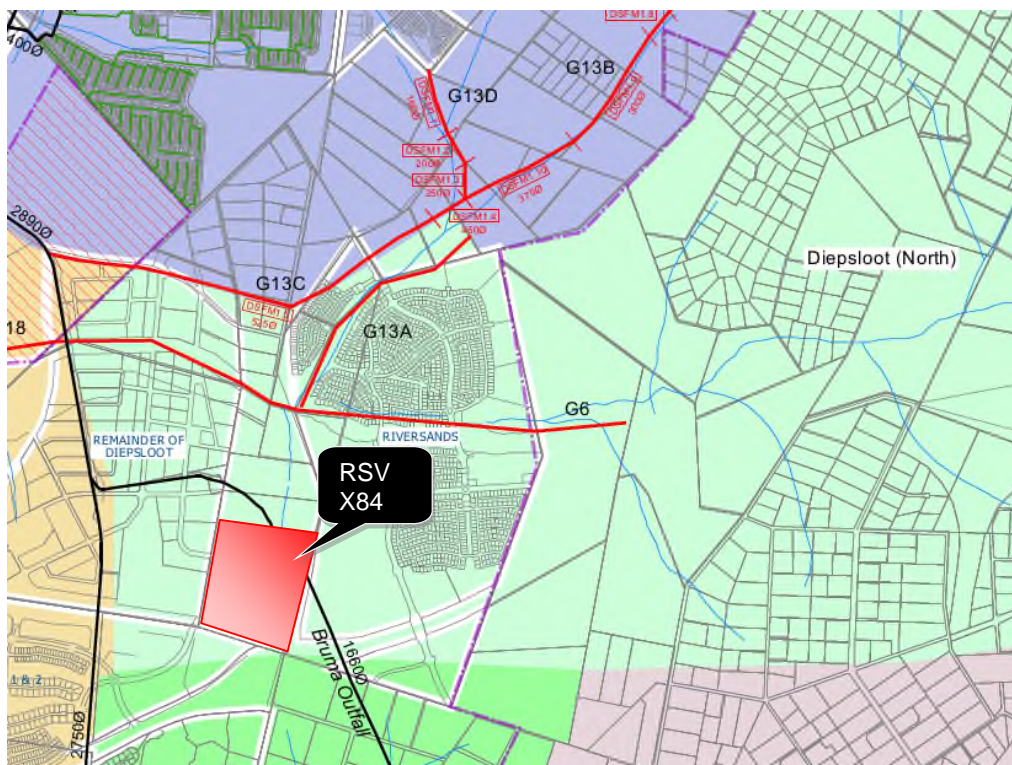


Figure C2.2: Diepsloot North Drainage Zone

Section C 2.3 Design Norms and Standards

The sewerage design standards were also taken from Table A3 Reference A and are summarised in Table C2.3.

TABLE C2.3: Sewerage Design Standards

	PARAMETER	ELEMENT	GUIDELINES
1.	Minimum Pipe diameter	Gravity sewers	160 mm
		Connections	110 mm
2.	Minimum Velocity at full flow	Gravity sewers	0,7 m/s
		Rising mains	0,7 m/s
3.	Peak Factor	Residential	2.5
4.	Stormwater Infiltration		15% of design flow
5.	Pipe capacity	Flow level in pipe as percentage of diameter	67% at design flow
6.	Minimum Gradients for Pipes	100 mm dia	1 : 60
		150 mm dia	1 : 140
		200 mm dia	1 : 200
		300 mm dia and bigger	1 : 350

	PARAMETER	ELEMENT	GUIDELINES
7.	Hydraulic Calculations	Manning Equation	n = 0,012
8.	Pipe Materials	All pipes	uPVC Class 34
9.	Location of Sewers	Street Reserve 10.5 Reserve 13 m Reserve 16 m Reserve 20 m Reserve	1m from road reserve boundaries 2m from road reserve boundaries, 2m from road reserve boundaries 2m from road reserve boundaries (All on low side of road reserve)
10.	Connections	For Stands	110 mm uPVC with slip on couplings
11.	Cover over pipe	In road reserves Other areas	1 400mm (min) 1 000mm (min)
12.	Manholes	Spacing	80 m maximum

Section C 2.4 Connections to Existing Services and Proposed Sewer Scheme

As part of the development of Riverglen Erf 23 a 200mm diameter sewer line was constructed within the road reserve of View Road. This sewer pipeline connects to existing Bruma Outfall Sewer as indicated on Drawing No. 1459.10.ZA.06.A070 included in Annexure D. Provision has been made for a future connection from Riverside View Ext 84 onto this sewer pipeline.

Section C 2.5 Sewerage Design Discharge

The design demands used for the proposed development are summarised in the table below. Based on the proposed zoning and the applicable FSR, various alternatives for the combination of different land-uses are available, for the purposes of this report, a proportional split between each of the proposed land uses has been done to provide a balanced estimate of the demands.

The sewer network will be designed to provide a connection point to each stand, either adjacent to the sewer pipeline or across the street from the sewer pipeline.

The design discharge used for this development is mostly derived from the guidelines proposed in *Table A3 Reference A* and are summarized in *Table C2.5*. The total average annual dry weather flow for Riverside View Ext 84 amounts to 0.35 Mℓ/day, with a peak wet weather flow of 9.721ℓ/s.

TABLE C2.5: Sewerage Design Demands

Development Erf	Land - use	Area (ha)	Usable Area, (%)	Unit Demand	Average Demand(ADWF) (Mℓ/day)	Peak Factor	PWWF (ℓ/sec)
Erf 1, 2: "Special" with Place of Instructions, Residential buildings and Offices, including ancillary uses such as restaurants and shops FSR = 0.6	Place of Instruction	19.23	40	15ℓ/pupil/day	0.04	1.5	0.749
	Residential Buildings (Student Accommodation)		35	0.55kl/100m2/day	0.22	2.3	6.799
	Administrative Offices		15	0.30kl/100m2/day	0.05	1.3	0.898
	Shops		7.5	0.18kl/100m2/day	0.02	1.5	0.311
	Restaurants		2.5	0.65kl/100m2/day	0.02	3.0	0.749
3	Special for access control	0.291	-	500ℓ/unit	0.0005	2.3	0.015
4	Special for private road	-	-	-	-	-	-
5	Private Open Space	-	-	-	-	-	-
Total					0.35		9.721

In order to calculate the peak flow expected within the sewer reticulation it is important to note that the land use type will govern the time of day where a peak in sewer flow run-off takes place. As a result peak flows for residential and non-residential stands will not occur at similar time periods in the day.

Section C3 Road Infrastructure

Section C 3.1 Access points and external road network

Regional access to the proposed development site will be from the future Rose Road/William Nicol Interchange. The future extension of Rose Road will continue and eventually merge with the east-west road, Porcupine Park Avenue. View Road serves as the north-south link to the development. The future Rose Road Interchange and surrounding road network is indicated on the Road Layout Plan, Drawing No. 1459.10.ZA.03.A073 included in Annexure E.

The Township Layout Plan has made provision for access to Extension 84 from the turning circle located to the south west of site at the intersection of View Road and Zeven Road. However, it is recommended that an alternative access point be provided from View Avenue. Recommendations from the Traffic Impact Assessment regarding preferred access points will be taken into account during the layout planning.



FIGURE C3.1: Existing Roads: View Road and Zeven Road

For further details pertaining to the potential external upgrades and access configuration refer to the Traffic Impact Assessment prepared by WSP Consulting Engineers.

Section C 3.2 Internal Roads

Internal roads for the development of Riverside View Ext 84 will be planned during the Site Development Planning stage. Internal roads will not be taken over by the Local Authority and will be maintained by the Body Corporate set up as part of the development management.

Section C 3.2 Standards and Specifications

The design criteria of external roads are to be based on the design standards of the Johannesburg Roads Agency and the Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development. The criteria are given for the various road classes on relevant road reserve widths.

TABLE C 3.2: Road Design Criteria

Parameter	ROAD CATEGORY			
	Local Distributors (Bus Routes) Class 4	Residential Access Collector Class 5a	Residential Access Loop Class 5b	
Road Reserve Width	20 m	16 m	13 m	10.5 m
Carriage Way Width	7.4 m	6 m	6 m	5.5 m
Minimum Centre Line Radii for Angles of Deflection less than 60°	150 m	120 m	15 m	10 m
Minimum Centre Line Radii for Angles of Deflection 60° and More	50 m	50 m	15 m	15 m
Roadway shoulders	1.8 m	1.8 m	1.1 m	-
Desired Maximum Speed	60 km/h	50 km/h	40 km/h	40 km/h
Minimum Stopping Distances	85 m	65 m	45 m	45 m
Minimum Gradient	0,5 %	0,5 %	0,5 %	0,5 %
Maximum Gradient	7 %	10 %	12.5 %	12.5 %
Minimum K-value	12	12	6	6
Minimum Vertical Curve	40 m	30 m	30 m	20 m
Cross Fall/Camber	2 % camber	2 % camber	2 % cross fall	2 % cross fall
Super Elevation	4 %	2 %	N/A	N/A

Section C4 Stormwater Drainage

Section C 4.1 Objectives of Stormwater Management

The objectives of the stormwater management plan are summarized as follows:

- To provide a stormwater drainage system for the convenience of the community and the protection of property from damage by the run-off from frequent storms,
- To prevent loss of life and reduce damage to property by the run-off from severe storms,
- To prevent land and watercourse erosion due to uncontrolled runoff,
- To enhance water infiltration into the subsoil,
- To achieve the foregoing objectives at reasonable implementation and maintenance costs.

Section C 4.2 Existing Catchment Areas and Stormwater Infrastructure

Existing stormwater systems are present within the areas surrounding the proposed development. The catchment delineation of the external stormwater run-off for the surrounding areas as well as the proposed Riverside View Ext 84 can be seen on drawing no. 1459.10.ZA.04.A073 included in Annexure F. The general catchment drains towards the perennial wetland area.

View Road acts as a stormwater cut-off for stormwater from Catchment Area 4, with some external stormwater being discharged onto the site by means of an existing underground piped stormwater system. This pipe system daylights at the intersection of Porcupine Park Ave and View Road and discharges stormwater into a shaped earth channel towards the natural wetland.

External stormwater from Catchment Area 2 is cut-off by William Nicol Drive. Given that this road is a Provincial Road, the road will not serve as part of the stormwater system and stormwater will be discharged onto adjoining properties. Provision should be made to during detail design to accommodate this additional run-off.

External stormwater from Catchment Area 3 originates from within the Steyn City Development. This catchment area drains towards Steyn City Boundary Wall and is discharged at the intersection of Zeven Road and William Nicol Dr into a pipe culvert and thereafter enters the proposed site as overland stormwater run-off.

Stormwater currently drains towards the natural low-point on the site. The temporary deviation of Porcupine Park Ave. acts as a stormwater cut-off and stormwater run-off is channelled through a series of 3 existing 600mm diameter pipe culverts which cross Porcupine Road and discharge stormwater into the area ear-marked for the future Rose Road Interchange. Once the Interchange has been completed a new bulk stormwater system will be constructed to discharge stormwater from Riverside View Ext 84 and associated areas underneath the Interchange and eventually terminating in the Wetland area located north of the future Interchange. This existing and future system is indicated on Drawing No. 1459.10.ZA.04.A072 included in Annexure F.

Section C 4.3 Drainage Philosophy

The general design concept is that stormwater run-off will be collected by conventional kerb inlets and an underground pipe system. The internal stormwater infrastructure will be designed to accommodate the minor and major design floods. The internal roads will form an integral component of both the major and the minor system. Details of the internal stormwater layout will be refined during the compilation of the Site Development Plan.

Section C 4.4 Stormwater Attenuation

It is a requirement of the Johannesburg Roads Agency that provision is made for stormwater attenuation to reduce the increased stormwater run-off resulting from the development to pre-development volumes through the incorporation of stormwater attenuation ponds in the stormwater system.

The proposed position of the location of an attenuation pond for Riverside View Ext 84 is indicated on Drawing No. 1459.10.ZA.04.A072 included in Annexure F. In consultation with the Wetland Specialist, it was proposed that the attenuation pond be incorporated as part of the existing wetland system with multiple discharge points from the pond to ensure that recharge of the wetland occurs. This will also prevent concentrated discharge at one point. The proposed attenuation dam will attenuate stormwater run-off from Erf 1 and 2. The existing stormwater system on View Road currently discharges onto the site, this system will need to be incorporated into the design of the internal stormwater network. It should be noted that provision to attenuate stormwater from external catchments has not been made as it is required that developments make provision to attenuate stormwater on-site and discharge attenuated stormwater to downstream developments; this is to minimise the impact of increased run-off on downstream developments. In the same manner, stormwater run-off generated by the development of Riverside View Ext 84 will be attenuated to pre-

development volumes so as to not adversely affect the Wetland area downstream, which is where stormwater will eventually be discharged.

JRA recommends that for each hectare of developed land, 350m³ of attenuation storage should be provided. To comply with the required attenuation storage measures the developable area of 17.72 hectares, which excludes the private open space (wetland) and existing Powerline Servitude to the south of the site, which will not contribute additional runoff. Based on this area the required storage volume was determined based on the JRA guideline. The dam should be designed to have a minimum storage of 6200m³, with a target depth of 1.5m an area of approximately 4150m² should be set aside for attenuation purposes.

Section C 4.5 Proposed Stormwater System

Site specific system will be design to ensure that stormwater will be collected and transported by means of an underground pipe system and discharged in the attenuation dam. The stormwater is mostly removed from the site in the roads. Open grass lined channels or energy dissipation structures will be constructed where stormwater pipes daylight.

The proposed stormwater system for the Riverside View Ext 84 development is divided into infrastructure required to drain the minor stormwater flood (1:5 year recurrence period) and the major stormwater flood (1:25 year recurrence period).

The minor stormwater system consists primarily of lateral kerb inlets, junction boxes, field inlets, overflow channels and pipe culverts. The major stormwater system primarily consists of pipe culverts. Cognisance of the stormwater infrastructure planned for the Rose Road Interchange needs to be taken into account.

Section C 4.6 Design Standards

Technical design guidelines are summarized in Table C5.6 below. A run-off coefficient of 0.28 for pre-development and 0.8 for post development will be used in the calculation of the peak flows. Standard details will be based on the standards of JRA.

TABLE 4.6: Stormwater Design Guidelines

No	Description	Guideline
1	Design Flood Determination Method	Rational Model
2	Average Annual Precipitation	750 mm
3	Design Flood Recurrence Interval	5 years and 25 years