27th April 2019 Reference: River Club\06 – v7

Capital Expenditure Project (Pty) Ltd
First Floor, Unit 10,
Boskruin Business Park
Bosbok Road, **Boskruin** 2154

Attention: Mr Stuart Walls

Re: River Club (Observatory) Development – Bulk Services Report
Electrical Services

We wish to take this opportunity to thank you for inviting this office to assist your company with the above. Based on the Site Master Plan from Vivid Architects plus the Area Schedule (Consultants) received we wish to confirm the following has been compiled for your information.

1 Total construction areas used

The following schedule has been compiled based on the information provided:

River Club - Electrical Bulk Mains Supply Rating Estimate - v15													
Item	Building Designation	Building Usage	Building Bulk (m^2)	Floor Plate (m^2)	Levels	Gym Space (m^2)	Retail Space (m^2)	Office Space (m^2)	Hotel + Restaurant Space (m^2)	Hotel Lobby Space (m^2)	Apartment Space (m^2)	School Space (m^2)	Basement Space (m^2)
1	**Precinct 1**												
2	Building-1	Gym / Retail	5080	1016	5	4064	1016						
3	Building-2	Retail / Offices	3550	710	5		710	2840					
4	Building-3	Retail / Offices	3550	710	5		710	2840					
5	Building-4	Retail / Offices	3550	710	5		710	2840					
6	Building-5	Retail / Offices	3550	592	6		592	2958					
7	Building-6a	Hotel / Restuarants / Lobby	3576	596	6				2980	596			
8	Building-6b	Hotel / Restuarants / Lobby	3960	566	7				3394	566			
9	Building-7	Retail / Offices	5136	571	9		571	4565					
10	Building-8	Icon Retail	1200	400	3		1200						
11	Building-9	Retail / Offices	12900	6450	2		6450	6450					
12	Building-10	Apartments / Commercial	5590	1118	5			1118			4472		
13	Building-11	Offices / Retail below	6100	1220	5		1220	4880					
14	**Precinct-2**												
15	Building-12												
16	Building-13	Residential	7800	975	8						7800		
17	Building-14	Residential	7800	975	8						7800		
18	Building-15	Residential	7800	975	8						7800		
19	Building-16	Offices	5000	834	6			5000					
20	Building-17	Offices	9475	1053	9			9475					
21	Building-18	Offices	9600	960	10			9600					
22	Building-19	Offices	9600	960	10			9600					
23	Building-20	Offices	9600	960	10			9600					
24	Building-21	Offices	9600	960	10			9600					
25	Building-22	School	12700	1270	10							12700	
26	Building-22 Lower	School											
27	Basement Bulk	Parking / Plantrooms	4000										
28						Gym Space (m^2)	Retail Space (m^2)	Office Space (m^2)	Hotel + Restaurant Space (m^2)	Hotel Lobby Space (m^2)	Apartment Space (m^2)	School Space (m^2)	Basement Space (m^2)
29		Total Areas				4064	13179	81366	6374	1162	27872	12700	25000

Schedule-1 – Construction Areas

These areas have been divided into a number of differing occupancies as indicated above, to which we have applied various figures to determine maximum demand.

2 Bulk Services Electrical Maximum Demand

Based on the above, the following schedule has been prepared:

River Club - Electrical Bulk Mains Supply Rating Estimate - v15										
Item	Building Designation	Building Usage	Gym Space (m^2)	Retail Space (m^2)	Office Space (m^2)	Hotel + Restaurant Space (m^2)	Hotel Lobby Space (m^2)	Apartment Space (m^2)	School Space (m^2)	Basement Space (m^2)
29		Total Areas	4064	13179	81366	6374	1162	27872	12700	25000
30		Loading (VA/m^2)	75	90	65	90	25	50	40	2
31		Total Demand / Area (Undiversified)	400	1200	5300	600	100	1400	600	100
32	**Total Site Demand (Undiversified) kVA**		**9700**							

Schedule-2 – Electrical Load Demand

Based on this schedule, the maximum demand for the site has been preliminarily calculated at 9.7-MVA. This maximum demand has been calculated based on best-practice minimum energy consumptive systems incorporating the following engineering solutions:

a. LED lighting technology to be adopted throughout the development, together with Time-of-Use and Occupancy Sensors incorporated to manage lighting and air-conditioning systems.
b. Centralized Air-Conditioning plant & systems to comprise latest inverter-based variable load capacity technology together with heat-exchanger systems to provide hot-water for local usage (minimizing the need for electrical heating).ensuring energy efficient load management.
c. Site energy management systems can be implemented ensuring load-demand management.

3 Maximum Demand Adjustments

It is worth noting that the above figure will be influenced by the time of day and the application of solar power sources. We have prepared the following table to illustrate the impact of solar power sources to the daily electricity demand:

River Club - Electrical Bulk Mains Supply Rating - Time of Day Usage												
Item	Description	Area										
		Gym	Retail	Offices	Hotel/ Restuarant	Hotel Lobby	Apartments	School	Basement Parking	Total	PV Contribution	Nett Total
											@ 50% rating	
1	Demand Load	400	1200	5300	600	100	1400	600	100	9700	-1000	
2	Time of day diversity											
3	00h00 - 00h30	20%	35%	20%	45%	45%	15%	15%	50%	2225		2225
4	00h30 - 01h00	20%	35%	20%	45%	45%	15%	15%	50%	2225		2225
5	01h00 - 01h30	20%	35%	20%	45%	45%	15%	15%	50%	2225		2225
6	01h30 - 02h00	20%	35%	20%	45%	45%	15%	15%	50%	2225		2225
7	02h00 - 02h30	20%	35%	20%	45%	45%	15%	15%	50%	2225		2225
8	02h30 - 03h00	20%	35%	20%	45%	45%	15%	15%	50%	2225		2225
9	03h00 - 03h30	25%	35%	20%	45%	45%	15%	15%	50%	2245		2245
10	03h30 - 04h00	25%	35%	20%	45%	45%	15%	15%	50%	2245		2245
11	04h00 - 04h30	60%	45%	30%	60%	60%	20%	15%	50%	3210		3210
12	04h30 - 05h00	80%	45%	30%	60%	60%	20%	15%	50%	3290		3290
13	05h00 - 05h30	80%	50%	50%	75%	75%	40%	30%	50%	4885		4885
14	05h30 - 06h00	90%	50%	50%	75%	75%	50%	30%	50%	5065		5065
15	06h00 - 06h30	90%	50%	60%	100%	100%	80%	40%	50%	6250		6250
16	06h30 - 07h00	90%	70%	60%	100%	100%	90%	50%	50%	6690		6690
17	07h00 - 07h30	90%	80%	75%	100%	100%	100%	60%	50%	7805		7805
18	07h30 - 08h00	90%	90%	75%	100%	100%	100%	100%	50%	8165		8165
19	08h00 - 08h30	100%	90%	90%	100%	100%	80%	100%	50%	8720		8720
20	08h30 - 09h00	100%	90%	95%	100%	100%	70%	100%	50%	8845		8845
21	09h00 - 09h30	100%	100%	100%	90%	90%	50%	100%	50%	8880		8880
22	09h30 - 10h00	100%	100%	100%	90%	90%	50%	100%	50%	8880	-600	8280
23	10h00 - 10h30	100%	100%	100%	80%	80%	50%	100%	50%	8810	-700	8110
24	10h30 - 11h00	100%	100%	100%	80%	80%	50%	100%	50%	8810	-700	8110
25	11h00 - 11h30	100%	100%	100%	80%	80%	50%	100%	50%	8810	-800	8010
26	11h30 - 12h00	100%	100%	100%	90%	90%	50%	100%	50%	8880	-800	8080
27	12h00 - 12h30	100%	100%	100%	100%	100%	60%	100%	50%	9090	-900	8190
28	12h30 - 13h00	100%	100%	100%	100%	100%	60%	100%	50%	9090	-900	8190
29	13h00 - 13h30	100%	100%	100%	100%	100%	60%	100%	50%	9090	-900	8190
30	13h30 - 14h00	100%	100%	100%	100%	100%	60%	100%	50%	9090	-900	8190
31	14h00 - 14h30	100%	100%	100%	100%	100%	50%	100%	50%	8950	-800	8150
32	14h30 - 15h00	100%	100%	100%	100%	100%	50%	80%	50%	8830	-800	8030
33	15h00 - 15h30	100%	100%	100%	80%	80%	50%	80%	50%	8690	-700	7990
34	15h30 - 16h00	100%	100%	100%	80%	80%	60%	80%	50%	8830	-700	8130
35	16h00 - 16h30	100%	100%	95%	90%	90%	70%	80%	50%	8775	-500	8275
36	16h30 - 17h00	100%	100%	95%	90%	90%	80%	80%	50%	8915	-500	8415
37	17h00 - 17h30	100%	80%	75%	100%	100%	100%	40%	50%	7725		7725
38	17h30 - 18h00	100%	80%	75%	100%	100%	100%	30%	50%	7665		7665
39	18h00 - 18h30	100%	80%	60%	100%	100%	100%	30%	50%	6870		6870
40	18h30 - 19h00	100%	90%	60%	100%	100%	100%	30%	50%	6990		6990
41	19h00 - 19h30	80%	60%	40%	100%	100%	90%	20%	50%	5290		5290
42	19h30 - 20h00	80%	60%	40%	100%	100%	80%	20%	50%	5150		5150
43	20h00 - 20h30	60%	60%	30%	90%	90%	50%	20%	50%	4050		4050
44	20h30 - 21h00	60%	60%	30%	90%	90%	50%	20%	50%	4050		4050
45	21h00 - 21h30	50%	40%	20%	80%	80%	30%	20%	50%	2890		2890
46	21h30 - 22h00	50%	40%	20%	80%	80%	30%	20%	50%	2890		2890
47	22h00 - 22h30	30%	35%	20%	45%	45%	30%	20%	50%	2505		2505
48	22h30 - 23h00	25%	35%	20%	45%	45%	20%	20%	50%	2345		2345
49	23h00 - 23h30	20%	35%	20%	45%	45%	15%	20%	50%	2255		2255
50	23h30 - 00h00	20%	35%	20%	45%	45%	15%	20%	50%	2255		2255

Table-3 – Electrical Load Demand Adjustments with Solar Power

4 Site Electricity Network Configuration Details including Phasing Requirement

At this time, we wish to confirm the following:

- We recommend the application be made for a ≤ 10-MVA Mains Supply for the site.
- This supply will be required to be provisioned as per the following phases:

  Precinct-1 1st Phase 6.0-MVA
  Precinct-2 2nd Phase 4.0-MVA

- It is expected that the City of Cape Town (Electricity Department) will bring a 11-kV Bulk Mains Supplies to the site, based on sub-divisions of the property development.
- Standard 630-Amp MV Switch-Panel will be well suited to this application (having a capacity of ±12.5-MVA).

- This will require one or more City of Cape Town MV Switchroom to be constructed
- We recommend the site be configured as two-of Medium Voltage rings to suit the precinct layout. This will ensure scalability and is best suited to any site construction program.
- Each building in each precinct to be connected to adjoining buildings via MV cabling fitted in/to sleeves/cable trays in the common underground parking areas.
- Provision will be required to link Precinct-1 to Precinct-2 via underground sleeves. These sleeves will be buried in the ground in a defined “electrical servitude”.
- Each building (in both precincts) will be equipped with a dedicated power transformer and medium voltage Switch-Panel, connected to one of the precinct ring feed loops.
- This will require a medium voltage switchroom and transformer room in each building, most likely and best suited in the basement parking areas.
- It is envisaged that on buildings where the electricity supply connection is ≤ 500-kVA, the mains connection will comprise a mini-sub-station (incorporating MV Switchgear, Power-Transformer & Main LV Switch).
- Buildings requiring a mains supply ≥ 500-kVA will be fitted with separate MV Switchgear Panels, Power-Transformers and LV Power Panels. In this instance, the LV Power Panels will be fitted in separate but adjoining rooms.

5 Incorporation of Solar Power

We have assumed that using 330-Watt Solar Panels, angled at 15° to the horizontal and fitted in rows of four-panels per access-aisle (for cleaning and maintenance), fitted over ≤ 60% of the available roof space will provide ≥ 2.0-MW of total power to the site at peak-demand. Please note that the Solar Power generated must be ≤ 1-MW per-erven to comply with Council Regulations and NERSA Specifications,

The solar panels will be series connected to 33-kW and 100-kW invertor sources, which will feed power to the LV side of individual building Main Distribution Panels. The Main LV Switch and the incoming Supply-Authority/Solar-Sources will be monitored and managed by Dual-Source Smart Meters, such that the electricity billing can be appropriately metered.

6 Energy Management

MV Power Systems Energy Management

The Bulk MV Supply to The River Club will be connected from the CCC MV Intake Panel via multiple incomer cables to a Consumer MV Panel dedicated to The River Club. All outgoing MV Ring Feed Supplies on the Consumer Panel will be connected down-stream of a Main MV Power Meter, intended to monitor and measure the total site electricity demand (by the City of Cape Town). Check-Meters to be installed by The River Club, as a means on self-monitoring and regulation of downstream electrical loads.

The River Club Consumer Panel will also incorporate provision for (future) connection of MV Generator Sources introducing the capability of providing centralized generator-backed sources for the entire site. Any power produced by these generator-backed sources will also be fitted with down-stream MV Consumer Check-Meters, ensuring energy consumption and production can be monitored and managed.

LV Systems Power Energy Management

On the LV Side of each Building Power Transformer, at the point of connection to individual building Main LV Panels, dual-source Smart Meters will be fitted; one connection to the LV Mains Supply and the other to the Solar-Power Sources, as indicated. All outgoing LV connections for the Main LV Panel will be fitted with Smart Meters as indicated.

The Smart Meters will all be connected to a common metering platform, whether by wireless data networks or by a LAN cabling system. This will ensure that the total site energy demand can be monitored and managed instantaneously.

Non-essential Load Management

Each Building Main LV Panel will be constructed in four sections, as follows:

- Solar Source Input Connection, including bus-coupler connection to Transformer Incomer
- Transformer Incomer Connection, including Transformer Main Switch, Non-Essential Load Connection/s (via contactor controls), including bus-coupler to Local LV Mains Supplies
- Local LV Mains Supplies Section
- Standby Generator Connection, including bus-coupler to Local LV Mains Supplies

Using the smart meter platform to monitor and manage the load, under high load conditions, non-essential load (such as air-conditioning, hot water heating, etc.) can be switched off, effectively providing load demand control.

Energy Blending with Solar Power Sources

As mentioned above, each building can be fitted with arrays of solar panels on the roof connected to LV Invertor Systems. These LV Sources will be connected to individual Main Building LV Panels as indicated and set up to feed power to load connections, supplementary to the CCC Mains Supply. The Dual Source LV Smart Meters will be installed and configured to monitor the electricity consumption, such that setup and management costs can be recovered from individual consumers.

7 Site Telephone Requirements

We wish to record the following requirements:

- The application for telephones needs to be submitted as soon as possible.

- It is expected that the Telephone Service Providers will bring Fibre-Optic Connectivity to the site.
- A dedicated multi-service-provider ODF Switchroom will be required in each building, as indicated in the attached drawings.
- The ODF Switchroom to be constructed in the basement parking areas as indicated on the attached drawings and constructed with cable trenches and gas protection systems.
- Each building will be equipped with a dedicated ODF Room and Fibre Switch-Panel, connected to the precinct feed loops. This MDF room is best suited in the basement parking areas.
- Each building must be connected to adjoining buildings via underground sleeves, at entrance points to basement parking garages as indicated in the attached drawings.
- We have included a single-line-schematic diagram indicated the connectivity and configuration of the MV supplies to the site.

I trust that this is clear and in order. Please contact this office if you require further details or information.

Yours faithfully

Charles Selkirk
Pr. Eng., S.M. SAIEE