



CNF
& Associates



Taronga Zoo Reptile & Amphibian Conservation Centre

Building Services Infrastructure Report

Document No. 21-084-RP-001

Taronga Zoo Reptile & Amphibian
Conservation Centre

CNF
& Associates

DOCUMENT TITLE:

REVISION:

Building Services Infrastructure Report

B

REVISION AND ISSUE HISTORY

REV	DATE	DESCRIPTION	OR	CH	AP	CL
A	04/06/21	Preliminary	L.N	S.I	L.N	
B	24/06/21	Minor Amendments	L.N	S.I	L.N	

OR=ORIGINATED, CH=CHECKED, AP=APPROVED, CL=CLIENT

ADDITIONAL INFORMATION:

Contents

1	Introduction	3
1.1	Brief.....	3
1.2	Reptile & Amphibian Conservation Centre.....	3
2	Services Required	5
2.1	Electrical Services	5
2.2	Mechanical Services	5
2.3	Hydraulic Services.....	6
2.4	Gas Services.....	7
2.5	Fire Services.....	7
3	Existing Infrastructure Identified.....	8
3.1	Electrical Services	8
3.2	Mechanical Services	8
3.3	Hydraulic Services.....	8
3.4	Gas Services.....	8
3.5	Fire Services.....	9
4	Services Tie In.....	9
5	Appendices	10
5.1	Appendix A – Substation 4 Single Line Diagram	10
5.2	Appendix B – Site Services Site Layout	10

1 Introduction

1.1 Brief

CNF & Associates has been engaged to undertake concept design of electrical, mechanical, and hydraulic services for the new Reptile and Amphibian Conservation Centre planned for the Taronga site, and to prepare a “Services Statement” for the Development Application. This document has been produced to fulfil the needs of the Services Statement and should be read in conjunction with the Concept Design Report to gain a fuller understanding of the design. This document includes the results of a review of existing site services and how the new facility can be tied into the existing site services.

The review was undertaken with reference to existing drawings and documents provided by Taronga Zoo, including architectural drawings of the proposed centre.

This report assesses the current services infrastructure and the suitability for this infrastructure to be retained and provides recommendations for further investigations and a proposed tie-in plan.

The comments in this report are made on the basis of the validity of the information provided and shall not be relied upon as providing any warranty of the services and equipment.

1.2 Reptile & Amphibian Conservation Centre

Taronga is a leader in reptile and amphibian conservation in Australia. The Taronga Conservation team has brought back seven reptile and amphibian species from the brink of extinction.

The development of the new centre will allow Taronga to continue to lead the recovery of species that would otherwise be lost to future generations. It will provide critical breeding space to support zoo-based conservation programs to ensure important species, such as Corroboree Frogs, are protected for decades to come.

The proposed centre will provide a new modern experience for guests to engage with reptiles and amphibians which will be designed with the latest best-practice standards for animal care and welfare. It will be an educational and multi-layered experience for guests that showcases the beauty and diversity of some of the most misunderstood and most imperilled creatures on the planet under threat, from climate change, disease, and habitat modification.

The new Reptile and Amphibian Conservation Centre (RACC) will be built on the existing Taronga site, occupying approximately 1,700 square metres of land currently occupied by the lemur enclosure and adjacent unused areas. The facility will need the following services:

- Electricity Supply
- Water Supply
- Sewer/Drain Connection
- Fire Services

The facility will be served with its own Heating, Ventilation and Air Conditioning (HVAC) systems. The HVAC systems will provide ventilation for the Plant Room and other Back of House areas and air conditioning for staff areas in the Back of House as well as all animal exhibit areas/rooms.

2 Services Required

2.1 Electrical Services

The RACC facility will be supplied with electrical power from the existing Taronga power distribution system's substation 4, located to the south of the proposed facility. The total expected load (maximum demand) is 186.95kW or approximately 300 Amps per phase, which can be provided via a new submains feeder comprising of 4 single core XLPE cables of 150mm² copper cables installed in a single underground conduit of 150mm diameter. A single line diagram of the proposed power supply is included in Appendix A of this document.

The load group breakdown is as follows:

No	Equipment/Devices	Rating (kW)
1	Water Treatment Plant	12.09
2	Ventilation System	4.58
3	HVAC System	47.66
4	Exhibit General Lighting & GPOs	53.85
5	General Lighting & GPOs	45.49
6	Underfloor Heating	23.28
Total		186.95

2.2 Mechanical Services

The animal exhibit rooms have a wide range of temperature and humidity requirements which differ significantly from the personnel areas of the BOH areas which are air conditioned. In response the design has adopted a segmented approach with six separate air conditioning systems installed in the plant room and ducted to the required areas.

Heating/cooling calculations were undertaken for all air-conditioned spaces and each space allocated to an air conditioning unit selected to deliver the required load optimally.

Preliminary sizing of the air conditioning units is as follows:

Item	Air Conditioner Service	Cooling/Heating Capacity(kW)	Electrical Load (kW)
1	GF-AC-1 (Ground Floor)	15.0/15.5	6.72kW
2	GF-AC-2 (Ground Floor)	26/27.7	10.56kW
3	RT-AC-1 (Roof Top)	26.5/26.1	10.56kW
4	FF-AC-1 (First Floor)	15.0/15.5	6.72kW
5	FF-AC-2 (First Floor)	10.0/10.1	5.66kW
6	FF-AC-3 (First Floor)	18.5/18.8	7.44kW
Total		111/113.7	47.66kW

Additionally, to provide adequate ventilation, the design has identified a total of 18 wall-mounted fans will be required to provide 12 air changes per hour for all enclosed areas. The actual air volume that is moved mechanically throughout the facility will be 3.86m³/s.

The fan schedule developed is below:

Item	Fan Service	Fan Size (kW)	Air Flow (m ³ /s)
1	GF - PLANTRM	1.1	0.9
2	GF - FOODPREP	0.37	0.26
3	GF-WSHOP	0.19	0.18
4	GF-GENSTORE	0.37	0.23
5	GF-BULKSTORE	0.095	0.06
6	GF-CHEMSTR	0.09	0.07
7	GF-WASTESTR	0.09	0.07
8	GF-LOADDCK	0.37	0.43
9	GF-OA-AC1	0.18	0.12
10	GF-OA-AC2	0.37	0.28
11	GF-FOODPREP	0.18	0.25
12	LIFT SHAFT	0.18	0.34
13	LIFT CAR	0.09	0.12
14	FF-OA-AC-2	0.37	0.1
15	FF-OA-AC-1	0.18	0.13
16	FF-OA-AC-3	0.18	0.14
17	RT-OA-AC-1	0.12	0.05
18	GF-STAFFAMEN	0.05	0.13
Total Load		4.575	3.86

2.3 Hydraulic Services

Taken as a whole, the various competing requirements for water systems leads to a determination that three distinct and separate water systems are required. They are:

- Potable Water
- Dechlorinated Water
- Reverse Osmosis Water
- In summary, the requirements for each system are:

No.	System Name	Application	Capacity m ³ /hr
1	Potable Water	Most enclosures with pools and staff amenities	64.075
2	Dechlorinated Water	Most Amphibians and pools where fish may be added	11.75
3	RO Water	Frogs & tadpoles pools, and misting sprays	0.25

The main potable water line feeding the new centre will need to provide source water for the Dechlorinated Water and RO Water systems to be installed in the plant room, so it will need to be able to provide approximately 75m³/hr (peak flow without diversity). A single 100mm diameter incoming potable water service will provide adequate capacity to the facility (operating at a flow velocity of under 2.5m/s).

As normal operations will include regular draining and washdown/hose down of the exhibit pools, a 150mm drain manifold will be provided to run adjacent to all exhibit rooms. Each pool/exhibit will be provided with a minimum 50mm diameter drain line to connect to the drain manifold via a manually operated valve located adjacent to each pool. Floor drains and pool overflow connections will also be connected to the drain manifold but will not be able to be isolated.

The drain manifold will also collect the drains/discharges from the BOH areas and the backwash water from filters and the RO units. The drain will then discharge via a 150mm line to the sewer connection.

2.4 Gas Services

The design has not identified any requirement for a gas service to be implemented for the new facility. There may be a requirement for heating of some of the larger pools, and rather than using fossil fuel combustion to achieve this requirement, the detailed design phase will develop a waste heat capture system from the air conditioning units via air/water heat exchangers. This approach is in keeping with Taronga's overall ESD initiatives.

2.5 Fire Services

While the BCA consultant's report is not yet available, it is expected that the existing fire main will be suitable to provide fire water to the new facility, as the design incorporates materials that will present a low fire load. However, two new fire hose reels and booster stations should be allowed for.

3 Existing Infrastructure Identified

3.1 Electrical Services

The existing site distribution network includes two possible substations that would be suitable for the connection to the new facility, namely Substation 4 and Substation 7. Both Substations were reviewed, and Substation 4 has been selected because:

- It has adequate capacity.
- There are spare locations on the main switchboard for installation of a new feeder circuit breaker.
- The route from this substation is considered to be easier and simpler to install.

The highest reported existing load on Substation 4 is approximately 255kVA, and its rating is 750kVA.

The Substation is located approximately 50m to the south-west of the new facility.

3.2 Mechanical Services

The new facility's HVAC services will operate as a stand-alone system, so no connection to any existing mechanical services is required.

3.3 Hydraulic Services

An existing potable water mains line has been identified running to the south-west corner of the new facility. This line is a spur line from the main interconnector located approximately 50 metres further south and appears to be a disused line that served the old seal exhibit. As this exhibit was a major water user, it is assumed that this line will be at least 100mm diameter and hence suitable for the RACC. It is recommended that this line be inspected and tested and replaced if found to be unserviceable.

There is a main north-south trade waste/sewer backbone running approximately 30 metres to the south of the new RACC, terminating in a pit at its northern end and joining the site-wide sewer system to the south. Being a main backbone, it is assumed that this line will be at least 150mm diameter and suitable for taking the expected wastewater from facility. It is recommended that this line be inspected and tested and replaced if found to be unserviceable.

3.4 Gas Services

Although there is an existing gas service line running approximately 50m to the south of the facility's planned location there is no current plan to use has, so no tie-in to this service is required.

3.5 Fire Services

There is an existing fire booster station adjacent to the facility's planned location, and it is expected that this will provide adequate flow and pressure to fulfil the requirements for the new facility. This assumption should be checked/verified by the BCA consultant.

4 Services Tie In

Given the services required and the existing services identified, a simple services tie-in plan has been developed and documented in Appendix B of this document.

The project will need to develop a single north-south trench from Substation 4 to the new RACC site. This single trench will be used to install a new 150mm diameter electrical conduit (with pits at either end), as well as the extension of the existing sewer line from its current termination point approximately 30 metres to the south of the RACC.

The trench runs alongside the existing potable water service line, so can be used to install a new line if the existing potable water service line is found to be unserviceable. Further, the trench will also expose the existing sewer line (up to its termination point), and hence can be used to replace the sewer line if it is found to be unserviceable.

5 Appendices

5.1 Appendix A – Substation 4 Single Line Diagram

Documentation has been collated separate to this design report; please refer to electronic copy of documentation listed in the table below for Appendix D.

DOCUMENT	DESCRIPTION
21-084-S-E-001_A	SUBSTATION 4 SINGLE LINE DIAGRAM SKETCH

5.2 Appendix B – Site Services Site Layout

Documentation has been collated separate to this design report; please refer to electronic copy of documentation listed in the table below for Appendix H.

DOCUMENT	DESCRIPTION
21-084-M-010_A	TARONGA ZOO SERVICES SITE LAYOUT