

# LAKE ST CLAIR SERVICES REVIEW REPORT

Prepared for  
X Squared Architects

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## **1. EXECUTIVE SUMMARY**

### **1.1 Scope of Report**

This report has been prepared on behalf of X Squared Architects, the existing services remain as per the Cynthia Bay services design approval as per the current Development Application.

The amended proposed *Master Plan* will highlight any revised changes proposed and identify any positive or negative impacts regarding the introduction of any service amendments.

### **1.2 Summary**

This report identifies the appreciation and the sensitivities and impacts of any introduction or changes to the existing approved method of installation or materials proposed for the Cynthia Bay proposal.

The following report has reviewed all initial and proposed services that are necessary for the implementation of this proposal to be successful within the current EMP and world heritage guidelines and standards.

***Review of identified scoped items are as follows;***

## **2. HYDRAULIC SERVICES**

### **2.1 Introduction**

The points summarised below provide previous and current background information of any increase or decrease of service requirements.

The load checks are comparable from the existing design approval to the proposed design, these are based on expected people numbers and a full review of the proposed master plan provided.

The outcomes from this brief has been evaluated with information supplied from x Squared architects and the client (ES Link).

### **2.2 Water Reticulation**

The water reticulation methods that were previously designed have limited changes, these require an upsizing of pipe to service the increased load requirements to the proposed cabins, installation method previously required (under boardwalks) is still preferred method of installation, pipe size requirements will be evaluated as per regulatory requirements.

An upgrading of water supply may be necessary depending on the increase of demand notwithstanding the introduction of spa baths.

## **2.3 Sewer**

The introduction of the revised proposal has allowed a positive engineered solution that allows for the deletion of the previous approved in-ground macerator tanks that required excavation of the glacial- moraine to a more environmentally sustainable solution that involves the placement of 2.5 cubic metre tank under the substructure of each cabin and linking the services to the boardwalk and pumped directly into the sewerage system.

This proposed method has all positive advantages that include; Minimal Impact, Installation and Maintenance friendly, Ease of removal if required, these attributes were not identified with the existing proposal of the in ground macerator tanks that required a total excavation impact of some 16 m<sup>3</sup>.

The proposed tanks will also feature acoustic treatment to alleviate any sound transmission that the pumps may perpetuate; this will also act as an insulation barrier.

In summary the proposed tanks will have a minimal impact as they are removable and require no intrusive excavation as the previous design, they also are designed to hold a full twelve hour period of retention in the event of any pump failure. The tanks may also be banded if required to alleviate any concern of treatment discharge in the event of any damage incurred.

## **2.4 Pumps**

The proposed pumps are a stand alone portable / replaceable item, it would be envisaged that the proponent would carry replacement pumps that would be easily installed in the event of a failure, as mentioned in the above the tanks have a twelve hour holding period at full discharge demand and advice received from ES Link indicate the management system in place can respond in the event of this situation.

The design would also incorporate a high level and failure alarm that would be linked to the manager's office.

In summary the revised outcome of this design has no impact and is a positive solution to be incorporated into the revised master plan.

## **2.5 Fire Services**

The existing fire services required were adequate under the previous proposal, in review the layout and person numbers have not increased, it would be assumed that no upgrade or revised design is necessary unless changes have been introduced by a statutory authority since the approved Development Application has been invoked.

## **2.6 Surface Water Control**

The current master plan indicates that the only change to this affected discipline is increased roof area to the proposed cabins. The existing approved proposal design indicated a gable roof where as the current proposal indicates a skillion roof, all water run off will inadvertently be collected to one side, this will require an upgrade in the design of the intended

water dissipation and retention, previous surface water control calculations indicate that the expected increase will have no adverse effect to the ground water retention or discharge.

Water runoff from proposed powered campsite relocation will have the same design constraints as existing approved methods, the storm water runoff is directed into shoulder drains which are lined with natural flow dissipaters (branches vegetation local rock) and revegetated to assist with the removal of contaminants and erosion control.

## **2.7 Rainwater Recycling / Collection**

Further to the item “*Surface Water Control*” a proposed *rainwater catchment* system could be incorporated into the cabin design for usage of water to the toilet cisterns, this would be a proactive approach for the saving of water usage (approx 2100 litres per day) and localise water discharge through an overflow, the proposed tanks would be attached to the cabins so as to create no additional footprint or adverse impact to the cabin area and by managing the roof area discharge any upgrading of the water delineation required would have no additional impact.

## **2.8 Proposed Flow Rates**

The review of the proposed master plan indicates the following flow rates based on a cabin design incorporating the following discharge as per the attached floor plan, this equates to a cabin load of 265 litres per person per day (x5) incorporating a peak 4 hour load period, the group load for this is 23,850 litres per day.

The estimate for the 32 person backpacker accommodation block is 90 litres per person per day, this equates to a group load of 2880 litres per day.

The group load estimated for the revised proposal is 26,730 litres per day which equates to 1.392 l/s

## **2.9 Summary**

In review the required design inputs have no significant negative impact under the guidelines set out in the EMP adversely there are positive outcomes with the revised proposed sewerage holding tanks, their implementation allow for the removal of the previous in ground type that had a significant ground disturbance in their installation method, the revised solution provides a more manageable outcome with safety and environmental aspects not previously identified.

The revised flow rates are indicative of research provided by ES Link in the use of acceptable fixtures to be incorporated into the cabin design, the revised flow rates are an acceptable increase to the new proposal

### **3. FOUNDATION / FOOTING SYSTEMS**

#### **3.1 Introduction**

The purpose of this review is to provide a comparison between two types of foundation / footing systems, these being *Screw pile and Mega Anchor*, the two systems were identified as approved methods under the requirements of the current EMP document.

The proposed cabin redesign indicates that Mega anchor is the preferred method where as the Screw pile was designed for the existing proposal.

After the review a number of issues were identified that primarily related to environmental impacts and installation methodology.

The outcomes are purely based on environmental and installation constraints with no monitory biased affecting the conclusion.

The use of a footing system approved in the current EMP minimises the amount of excavation required to establish the footings (eg augured or mega anchor footings reduces the impacts on geo heritage issues)"

#### **3.2 Screw Pile**

The screw pile system requires a 88.9 x 5.5 cylindrical pipe with a 300mm diameter helix inserted into the ground until it achieves its designed torque.

These are made of a corrosive resistant material and are able to be removed by reversing the installation method.

The use of a structural framing system is incorporated into the design so that it reduces the need for extra footings generally, where footings are required the use of a footing system that minimises the amount of excavation required to establish the footings reduces the impacts on geo heritage issues.

#### **3.3 Capability**

The positive qualities of the screw piles are that there are marginally less required and they are able to be installed within close proximity of any existing services or obstructions ie; tree roots or rocks.

The piles may be founded in a variety of soil types including; clays, silts, sand and sedimentary rock, once the pile is founded to its required design torque it is levelled and connected to a structural member using CHS sleeves, removal and relocation is another feature of the Screw Pile capabilities.

### 3.4 Installation

The screw pile is installed using a 7-8 tonne zero swing rubber tracked excavator using a hydraulic torque head to found the pile, the approximate number of piles per cabin is 21, the excavator (zero swing) would be able to install all piles from the cabin footprint with minimal disturbance to other areas.

In the absence of a soil report the assumed design soil conditions would be approximately 200 kpa that would require the pile to be inserted to an approximate depth of 600-700mm.

The proposed screw pile is a vibration free displacement pile, the disturbed soil area is the base of the helix diameter (300mm), and the calculated area of soil disturbance per pile is as follows:

$$\text{Area of soil disturbed per pile} = \pi\Phi^2/4 = 0.07\text{m}^2$$

### 3.5 Removal

Screw Pile is a removable pile that is simply reversed as per the installation method, it would be envisaged that the pile would create some localized disturbance with quantities similar to the installation disturbance; it could be assumed that any material retrieved would be placed into the void created by the retrieval.

The removal method would also require an excavator with a torque head fitted.

### 3.6 Impact

The impacts identified with this method are primarily related to the installation requirements involving a rubber tracked (8 tonne approx) machine and soil disturbance from the insertion of the pile.

### 3.7 Mega Anchor

The revised proposal has put forward Mega Anchor as its preferred footing design, which is also an approved method within the EMP document.

The Mega Anchor system is a vibration driven pile, as with the screw pile the ground conditions were estimated at 200 kpa which would require a pile length of (average at 1.2 metres).

The Mega Anchor system has previously been used in Cradle Mountain, Coles Bay and Ben Lomond projects of similar nature.

### 3.8 Capability

The Mega Anchor is a 40mm diameter pipe with three angled collars attached to the base that are positioned with a vibratory driven pile to the designed depth required by a rotary jack hammer, the pile is usually galvanized for anti corrosion capabilities.

The design load dictates the amount of anchors required and may be engineered to carry over larger spans.



### 3.9 Installation

The installation of the piles to attach the mega anchor involves using a jackhammer (hand) to install the driven pile by the application of impact forces until to required depth is achieved.

The calculated number of Mega Anchors required for the proposed cabin design is 27 and would then require the cabins to lowered onto the installed base, this system also requires cross bracing similar to scaffold bays.

#### 3.9.1 Removal

The removal of the mega anchor system is achieved by using a proprietary device, soil disturbance when removed is relatively unknown as it would depend largely on the soil condition.

#### 3.9.2 Boardwalks

The previous proposed structural design incorporated the use of Screw Pile for the Boardwalk foundations, this design utilized a “Y” shape configuration to install the services on cable tray attached to this frame, the Mega Anchor system would also be compatible with the design parameters; eg over 3 bays of boardwalk one extra mega anchor would be required to support either side of the boardwalk.

#### 3.9.3 Summary

In conclusion the table indicates similar ground displacement and similar number of unit requirements. Generally the number of footings will be determined by the designed loads incorporated with building load, Live load and Snow Load, based on the geotechnical report.

The table below offers both minimal impact systems are comparable and the basis of using either system should be recommended on the basis of preference from the cabin manufacturer.

The above assumptions have been made notwithstanding a geotechnical report for recommended installation and retrieval methods.

	<b>Screw Pile</b>	<b>Mega Anchor</b>
<b>Capability</b>	- approx 21 numbers 88.9x5.5CHS	-approx 27 numbers
	- approximate 0.7m depth	- approximately 1.2.m average depth
<b>Ground Disturbance</b>	- Displacement Free Pile	- Driven Pile (displacement free pile)
	- 0.07m <sup>2</sup>	- 0.056m <sup>2</sup>
<b>Installation</b>	- 7-8 tonne excavator	- Jack Hammer
<b>Removal</b>	- Removable	- Removable
<b>Construction</b>	- Installed within close proximity	- Installed away from vertical obstruction. Distance from vertical obstruction is dependant on the length of pile.
	- Founded in clays, silts	- Founded in clays, silts
	- Founded on rock	- Founded on rock
	- Connected to steel frame	- Connected to steel frame

## **4. ELECTRICAL SERVICES**

### **4.1 Introduction**

A review of the electrical requirements for the proposed site identified the following details, any changes of power load requirements amended due to changes involving hydraulic design, cabin equipment schedules and any power reticulation upgrades.

Previous design loads were not calculated as it was assumed power supply to be sufficient for the existing and also appears adequate for the current proposal although a detailed investigation and subsequent calculations will be required to proceed with a design phase to fully assess the power supply requirements and existing power supply limit, any load upgrade required has no impact to either existing or current proposals.

### **4.2 Existing Power Supply**

The existing on-site High voltage infrastructure proposed in the previous development needed minor upgrade works as will the current proposal, this is mainly due to the increased load and increase to the equipment sizes to the Kiosk sub-stations.

The existing High Voltage overhead line is to be terminated at the proposed caravan site and all overhead wires are to be removed as per the current EMP requirements

### **4.3 High Voltage**

The High Voltage infrastructure currently runs overhead throughout the site, this is to be terminated adjacent the caravan site and relocated underground in a ring main beside the existing road.

The HV ring main will require location as per previous approved method and subsequently have no additional impact to the site.

The review undertaken also indicated that the position of the substation kiosk should be reviewed and a reduction by 50% of previous 4 down to 2 may be achieved.

### **4.4 Low Voltage**

The low voltage reticulation of the site from each sub-station will require upgrading from the previous loads indicated however these locations have not changed and site disturbances or impact will not increase.

SEMF have calculated approx 70 amps per phase due to the introduction of the spa baths and grinder pumps required for each cabin

### **4.5 Impacts**

The electrical review indicates that any upgrades required are as per the current proposal to the site are nil with the exception of more load required.

## **5. COMMUNICATIONS**

### **5.1 Review**

The revised proposal has identified no additional requirement, the previous review conducted on the Cynthia Bay site identified a Telstra service is available, there was no previous design or identification conducted but it would be assumed that a service is available as the Parks and Visitor Centre have access to phone and data and any requirements would be run in parallel with the implementation of all other services.

Communications requirements should be identified at design stage and be incorporated as part of the HV upgrade.

## **6. GAS RETICULATION**

### **6.1 Introduction**

The review and identification of existing LPG onsite provides another option for heating, hot water and laundry facilities, the feasibility of this option (*apart from an economics*) is considered acceptable.

The proposed development and site in general lends itself to gas reticulation, this would be incorporated if required with the other services positioned below the boardwalk on cable tray.

There would be no additional fire risk than there is with LPG currently on site and the instantaneous nature of gas is user friendly, the use of instantaneous hot water heaters would provide more floor space to cabins and provide continuous hot water for spa baths.

### **6.2 Installation**

The installation of gas would require a gas line run under the board walk to service all cabins, one or two large storage gas tanks would be required, this may be viewed as an impact but there are already a bank of visible cylinders adjacent the existing laundry block and gas storage at the visitors centre, if this option was viable the tanks may be incorporated into the new proposal to create minimal visual impact.